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PCB LANDFILL

SITE INVESTIGATION REPORT

Prepared for:

Joint Warren County / State PCB Landfill Working Group
and
The North Carolina Department of Environment, Health, and Natural Resources

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Executive Summary

EXECUTIVE SUMMARY

The basic goal of this investigation was to determine the current and potential environmental impact associated with the PCB landfill, and obtain improved information on the chemical wastes in the landfill. The major effort was centered on sampling and analysis of environmental media in locations that had a high probability of being impacted by releases from the landfill, as well as several background locations that, from a scientific perspective, would not be impacted by the landfill. Careful attention was given to using analytical methods with low detection limits so the reliable data would be obtained on the two key types of hazardous contaminants in the landfill, PCBs and dioxins/furans.

It is important to recognize that the current investigation used a relatively large number of sampling locations and comprehensive types of samples to reliably ascertain whether there had been major releases of toxic substances from the landfill impacting the surrounding environment. For the most part, however, with the exception of two directly adjacent wells, no evidence was found for contamination in surface waters, sediments, groundwater, and soil from off-site locations.

Reliable evidence was obtained from groundwater testing to indicate that leachate from the landfill has escaped into the subsurface immediately near the landfill at two locations. Moreover, analysis of changes in the volume of water in the landfill as well as observations of the top liner system concluded that significant amounts of water have been entering and leaving the landfill since it was constructed. Also, some limited data indicate that PCBs are probably escaping through breaches in the top liner system. The overall conclusion is that the landfill lacks integrity and has poor containment efficiency. This is consistent with the recent findings of the U.S. EPA that found the State in noncompliance with important regulatory requirements, especially an ineffective leachate collection system.

The results of this investigation supports detoxification of the landfill as the only reliable long-term solution to address the threats posed by a low quality landfill containing large amounts of PCBs and dioxins.

Section 1.0
Background

SECTION 1.0
BACKGROUND

1.1 Introduction

On March 7, 1996 the Joint State PCB Landfill Working Group and the North Carolina Department of Environment, Health, and Natural Resources, hired two Science Advisors, Patrick A. Barnes, P.G. of Barnes, Ferland and Associates, Inc. (BFA) and Dr. Joel Hirschhorn of Hirschhorn & Associates. The contract Scope of Work included identifying and recommending a feasible technology to detoxify the estimated 40,000 cubic yards of PCB contaminated soil contained in the Warren County PCB Landfill (see Fitgures 1.1 and 1.2 for location). A limited site investigation was proposed by the Advisors to obtian information to help define the nature and scope of detoxification, especially whether materials outside the landfill might require detoxification. The investigation activities was approved by the Joint Working Group and scheduled to occur concurrently with the planned detoxification efforts.

This document transmits and discusses the results of the following activities:

- Facility and Compliance Assessment
- Monitoring Well Construction/Site Evaluation
- Landfill Soil Removal
- Sampling and Testing
- Air Monitoring; and
- Upper Liner Integrity

This report also draws all necessary conclusions and makes appropriate recommendations based upon an independent technical evaluation of the detoxification goal.

1.2 Goals and Objectives

In general terms this report presents detailed information concerning the current and potential environmental impact associated with the PCB landfill, and improved information on the chemical wastes in the landfill. It is intended to assist in planning the scope of the remedial design and detoxification program. Specifically, it includes:

- Geological setting including definition of soil and rock types, permeable and confining layers, fractures and faults, hydraulic properties and potential contamination pathways;
- Direction and rate of groundwater and surface water flows and seasonal water table variations;
- Location and extent of off-site soil and groundwater contamination;
- Quality of surface water where it first appears from the ground water system in selected major draws surrounding the site;
- Quality of stream sediment in areas where sedimentation is most likely to occur;
- Detailed assessment of historical landfill operation;
- Analysis of the overall integrity of the landfill system;
- Data on the type and distribution of chemical wastes in the landfill.

This investigation was first formally proposed as a portion of the overall facility detoxification Master Plan, Figure 1.3. It was identified as a critical component to understanding the potential scope of the detoxification efforts, and was formally approved by the Working Group and the State on April 25, 1996.

The work was performed as a supplement to the previous Sampling Plan dated July 12, 1994 and therefore focus is in those areas where the existing work fell short.

It was agreed by the Science Advisors and the Joint Working Group that the purpose for performing the additional site investigation work is to:

- Establish the current integrity of the facility;

- Determine if the landfill had released PCBs and dioxins/furans in the environment;
- Determine the scope of the detoxification efforts;
- Address the concerns of the community;
- Establish a comprehensive network for long term environmental working locations;
- Determine if substantial discharges occurred during the land filling operations.

1.3 Investigation Approach

The work effort began with a detailed assessment of the State's file for the PCB Landfill facility. Review of the file identified existing data gaps, which needed filling prior to addressing potential detoxification. The field investigation was designed to move concurrently with efforts to identify screen and test detoxification technologies while filling these data gaps. The file and existing data review process continued throughout the contract period. Section 2.0 is a summary of the file review.

On July 3, 1996 a meeting was held between the two Science Advisors and Key State staff to outline the scope of the planned investigations. At that meeting it was agreed that the field investigations would be a joint effort between the State and the Community, with the community being represented by the Science Advisors. In general terms the meeting identified the following:

1. Work activities would build on the existing state sampling program.
2. Additional monitoring wells, sediment, surface soil and surface water samples were needed.
3. The work should define groundwater flow characteristics both vertically and horizontally.
4. The additional wells should be placed in the best possible locations to accomplish both items 3 and 5.
5. A minimum of three background wells would be needed to provide offsite general water quality needed.

It was also jointly agreed that BFA would take the lead in the preparation of a supplemental sampling plan incorporating the items discussed above. The plan however would be implemented through formal request for proposals developed jointly by the State and Science Advisors. The advisors would also be involved in the contractor evaluation/selection and would inspect the work implementation.

The general design of field activities related to installation of monitoring wells, removal of landfill soils and analytical testing was dictated in formal requests for proposals. Air monitoring activities as well as PCB analysis was performed by the State. To address the community's concern of obtaining truly independent analytical results and also accommodate the State's budgetary concerns, Science Advisor split samples were replaced with coded samples. Only Science Advisors and the Working Group secretary maintained a copy of the code key.

Section 2.0
Facility and Compliance Assessment

SECTION 2.0
FACILITY AND COMPLIANCE ASSESSMENT

2.1 Introduction

It was deemed appropriate by the Science Advisors to review all available technical information on the site and the landfill's design, construction, and operation. Considerable information was available from State files and there had been previous site investigation work under the direction of a prior Science Advisor. However, a key component of the previous site investigation work was deemed unreliable by the current Science Advisors, namely whether credible data had been found for contamination of soil or groundwater outside the landfill by dioxins and furans. Therefore, an important aspect of the current site investigation was to produce new and reliable information on dioxins and furans through improved testing (i.e., with sufficiently low detection limits) and, particularly, through use of various background locations for sampling that could be reliably known to be free from contamination from the landfill. Some of the available information was important to designing the current site investigation, while other information was important in understanding the extent to which the landfill may have already caused uncontrolled releases of hazardous substances into the environment, and whether the State of North Carolina, as owner and operator of the landfill, was in compliance with applicable legal requirements established by the U.S. EPA for this landfill when it funded its construction and for all PCB landfills covered by the federal Toxic Substances Control Act (TSCA).

2.2 Site Selection Process

The original selection of the site for the landfill was done many years ago by the State. The State had considered various locations and made a case, which the U.S. EPA accepted, that the Warren County location was satisfactory. In some ways the location was reasonable, especially in comparison to many landfill locations in the United States that have been extremely poor. For example, the location was not in a wetlands nor immediately adjacent to a marine environment, and there were very limited use of private drinking water wells close the site. Nor, was there a high density residential area close to the landfill.

On the other hand, there were other issues that were not especially positive, including the fact that there was enormous local community opposition to the siting of the landfill which failed to dissuade the State, and the site has been generally credited with fostering the national environmental justice movement. In other words, it was generally seen that the State selected the site, either in part or in large measure, because of an African-American community that could not effectively fight the site selection process. And the location was complicated by a difficult to assess hydrogeological setting that was, in fact, never fully or accurately characterized prior to the decision to locate the landfill there. The complex nature of the hydrogeological setting complicated the design of a good groundwater monitoring system around the landfill and the current site investigation found it necessary to compensate for this prior inadequacy by locating new groundwater testing wells for this investigation and for improved future monitoring. Figure 2.1 shows the location of monitoring points prior to this investigation.

2.3 Landfill Design

The original design of the landfill became an issue when the Science Advisors examined available information and issued reports (See Appendix 1) that made a series of important observations, including the following (See Figures 2.2 and 2.3). The landfill's leachate collection system never seem to have operated properly from the very start, because large quantities of water known to be present in the landfill resulting from rain during construction and water in the wastes deposited were not removed. Moreover, it was discovered that the normal perforated pipe component of the main leachate collection system, above the bottom clay liner, had not been installed, even though it had been part of the State's original proposal to EPA when funding was sought. Also, various analyses of water levels in the landfill and seasonal variations in rainfall indicated that water was entering and leaving the landfill. The State itself had acknowledged at various times that there was considerable free water in the landfill and that the leachate collection system had not functioned properly. Attempts to dewater the landfill by the State had been opposed, however, by certain community interests. These findings by the Science Advisor played a role in designing the current site investigation, particularly the need to examine the integrity of the top liner system.

2.4 Regulatory Compliance

The analyses by the Science Advisor of hydrographs for water in and outside the landfill found that there had been significant violations of federal regulatory requirements with regard to monitoring and landfill design, construction, and operation. Whenever regulatory requirements have not been fully met, then there is a plausible argument that any landfill may not have achieved its fundamental goal, namely safe and reliable containment of the wastes disposed there. In this case, there were sufficient findings of regulatory noncompliance to justify a new attempt to obtain reliable technical data to ascertain whether hazardous landfill contents had had an opportunity to be released through any environmental medium, particularly surface and groundwater.

It is relevant to note that recently EPA has responded to the initial findings of the Science Advisors by officially declaring that the State had not complied with certain important legal requirements (see Appendix 1). In effect, EPA supported the proposition that the landfill could have caused the release of hazardous substances that happened because of design or construction deficiencies, or because routine monitoring had not detected the releases, or both.

2.5 PCB Air Monitoring

One of the Science Advisors performed an analysis that revealed that when the landfill had been constructed certain field measurements by EPA had found evidence of PCB air emissions and had recommended routine air monitoring (see Appendix 1 and 4), but the latter had not been done. Because this human exposure route issue was raised, some limited air monitoring for PCBs was included in the current site investigation and EPA performed its own limited air testing after the site investigation. The findings of the potential for air releases contributed to the importance of examining the integrity of the top liner (cover) system, because air emissions are most likely related to some loss in containment efficiency of the top liner system.

Section 3.0
Field Investigation Plan Procedures

SECTION 3.0
FIELD INVESTIGATION PLAN PROCEDURES

3.1 Procedure Overview

3.1.1 Team Organization

All field efforts by staff of the Division of Waste Management or its contractors were lead by the Division Site Manager (Mike Kelly). A Site Safety Officer was appointed by the Director of the Division (Pierre Lauffer) and functioned independent of the direction of the site manager.

The State team reporting to the site manager, consisting of 24 staff members, was necessary to complete all required field sampling, chain of custody, reporting and organizational tasks in an efficient manner. Individual members of the field team coordinated with the disciplinary task leader and the Science Advisors to develop the methodologies and protocols for the field sampling and analysis effort. Field personnel used for this project included individuals with the following backgrounds:

Environmental chemistry
Environmental engineering
Hydrogeology
Environmental toxicology
Analytical chemistry

The Science Advisors provided all sample labeling prior to giving them to the State personnel. Although the State personnel also placed identification numbers on the samples, they had no way of knowing from what location each sample originated. Field personnel from the State were rotated in such a way to ensure a reasonable level of consistency of reporting format. A minimum of 3 to 4 State professionals were present on any given day of field activities.

In addition, for dioxin samples, two (2) representatives of the selected independent laboratory were present to receive samples. This was necessary to comply with independent chain of custody and sample labeling requirements. A list of key project individuals and their associated roles is provided in Appendix 2. Unless otherwise approved by the Advisors and State Personnel, sampling activities were in accordance with the Supplemental Site Investigation Plan.

3.1.2 Oversight

The Science Advisor(s) to the Joint Warren County and State PCB Landfill Working Group directly witnessed field activities by the Division of Waste Management and contractors. All oversight individuals were currently trained by 40-hour OSHA hazardous waste worker standards and attended site safety briefings held by the Site Safety Officer. An EPA representative was also present the week of March 10, 1997 to inspect procedures and split select samples.

3.1.3 Site Safety

A site safety plan was prepared for the sampling and analysis event and was present on-site for the duration of the field activities. All individuals present during this effort as team members, oversight personnel, or observers were aware of the need to adhere to the requirements of this plan. The Site Safety Officer was the authority for the site safety plan's implementation. As is customary, this authority was separate from the authority of the site manager, who, along with the Science Advisors, had the overall field sampling plan responsibility.

State and outside contractor personnel involved in collection or sample handling were 40 hour OSHA trained and followed the delineation of the work zones provided in the Site

Investigation Plan.

3.1.4 Public and Media Observation

Members of the Working Group, the public, and media representatives observed some field activities. All observers to the site with the exception of the Science Advisor or other properly trained staff were accompanied at all times while on the property.

All observers present during the sampling program, (beyond the locked cross wire on the access road to the landfill) were required to attend a site safety briefing, sign a statement that they have received this instruction, and obey the directions of the site safety officer and their escort. Observers present during the sampling were required to be properly attired, including long-sleeved shirts, long pants, and sturdy shoes (e.g. work boots, hiking boots, or athletic shoes). Chemical protective overboots were provided upon request. Deviation from required attire was allowed solely at the discretion of the site safety officer.

3.2 Drilling and Sampling Activities

3.2.1 Monitoring Well Placement

In designing these monitoring wells, the following items were considered:

- Short-and long-term objectives;
- Purpose(s) of the well(s);
- Probable duration of the monitoring program;
- Contaminants likely to be monitored;
- Types of well construction materials to be used;
- Surface and subsurface geologic conditions;
- Properties of the aquifer(s) to be monitored;

- Well screen placement;
- General site conditions; and
- Potential site health and safety hazards.

Background Wells

It was agreed that none of the existing wells truly represented background conditions. The locations for the background wells were therefore selected based on spatial distribution around the landfill and the identification of property owners interested in having such wells. Generally, the wells are within 1 mile of the Warren County landfill. Drilling began on February 13, 1997 with the installation of the first Background Well (off-site well) OSW-1, which is located west-southwest of the landfill. Construction of OSW-1 was followed by OSW-2 through 4, which are generally located south, east and west of the site, respectively. With the exception of OSW-3, the OSW's are screened across the weathered rock zone ensuring that they would monitor the same zones as the on-site wells. OSW-3 is screened just below the water table to allow comparative analysis of landfill perimeter wells also screened in that zone. These background wells enable proper technical review of data collected at the remaining locations, by allowing us to filter out the contaminants, which might exist within the groundwater outside of the influences of the landfill. All OSW's were constructed of four-inch stainless steel and designed to allow use by the homeowners if water quality permitted. The location of the OSW's is given in Figure 3.1, and their construction is summarized in Table 3.1. OSW-1 was not sampled because of potential sources of contaminants identified in an adjacent gorge.

On-Site Wells

It was agreed that the existing monitoring wells were too few. Additionally, they (Figure 2.1) were improperly designed and poorly located. Therefore, they may not intercept potential subsurface discharges. BFA surmised from the initial site analysis, presented in the Site Sampling Plan, that the partially weathered rock zone closest to hard bedrock may represent the most critical avenue of off-site discharge and therefore needed monitoring. In this report, that zone may be referred to as either the weathered rock zone or saprolite. Some of the needed data could be obtained by installing new wells adjacent to certain existing wells.

Two additional deep groundwater samples were therefore obtained from new wells installed adjacent to existing wells MW-3 and MW-4. These wells yielded samples from the weathered rock zone (Figures 3.2 and cross section Figure 4.4). These wells which are designated MW-3D and 4D are also important to establish the vertical flow component at key existing locations. The new hydraulic and groundwater quality data when compared to that of the existing wells at those locations, will give us an indication of the relative transmissivity of each zone and how much of the local recharge reaches the saprolite zone.

Water table and saprolite zone groundwater information was also obtained at locations directly north, south, east and west of the landfill within 25 feet of the landfill footprint. These five locations have wells which are designated MW-1A, MW-5S, D and MW-7S, D are critical to the establishment of a proper flow net for the immediate vicinity of the landfill. Paired wells or clusters were used when locations contained greater than 30 feet of saturated thickness above hard rock.

Groundwater samples were also collected in the three major draws located to the north, northeast and northwest of the landfill and in the one major draw located to the southeast. These wells are designated MW-6, MW-8, MW-9 and MW-10. Of these gorge wells, only location 10 contains both a shallow and a deep well.

The location of each of the site monitoring wells and their construction is given on Figure 3.2 and Table 3.1, respectively. It is very difficult, if not impossible, to develop a monitoring network which will capture 100% of the flow in a fractured rock system. These well locations selected are positioned to minimize the guesswork. Assuming radial flow, the seven wells located near the toe of the landfill are in a good position to warn against serious environmental releases or detect releases from the landfill before they occur. Additionally, because the orientation of the draw features, which surround the site, is dictated by fractures, enhanced directional groundwater flow will occur along these fractures. By locating five monitoring wells within these features we have a higher probability of detecting groundwater flow as it leaves the landfill site area.

Because of the connection between groundwater flow and these draws, it is important that they be monitored with wells located as close to where groundwater emanates from them as possible, but deep enough to intercept flow during low flow periods. The gorge wells were therefore installed at about the 300-ft. to 320-ft. elevation.

With the exception of VOCs, surface water collected within these draw features should have the same quality characteristics as that of the groundwater; however, monitoring wells are preferred because they allow samples to be collected during low flow periods.

3.2.2 Drilling Procedure

The drilling activities were accomplished by the Hollow Stem Auger drilling method for all monitoring wells, with the exception of MW-8. For MW-8, it was necessary to utilize the air hammer method because rock was encountered prior to hitting water. Soil samples were collected using split spoon samplers following Standard Penetration Test Procedures (STP) outlined in ASTM D1586-84.

Once again with the exception of MW-8, soil borings were installed at each well or cluster location. Split spoon samples were collected every five feet and the density of the soil recorded by the SPT methods. The soil recovered was used to visually classify the site lithology, identify depth to water and determine monitoring well construction.

The auger borings were also used to collect soil samples for analytical testing. Samples were obtained from just above the estimated water table surface at well locations MW-1A, MW-5, MW-7, MW-11 and MW-12. During the drilling of the OSW's soil was also collected and analyzed from just below land surface. Appendix 3 is a summary of the lithology encountered at each well location, as determined from the split spoon samples. A discussion of the site's lithology and the soil analytical testing is provided in Section 4.1 and 4.3, respectively.

3.2.3 Monitoring Well Design and Construction

Each of the new well clusters (MW-5S, MS-5D, MW-7S, MW-7D, MW-10S and MW-10D) includes two wells installed adjacent to one another and screened at different intervals. Within each cluster one well is screened at the water table but to capture the seasonally low water elevation and the other is screened within the saprolite zone immediately above the bedrock surface.

The field work was conducted in conformance with accepted engineering and geologic practices as well as the EPA Region IV SOP No. 6.0, the Groundwater Section's Guidelines for the Investigation and Remediation of Soils, and Groundwater and the Hazardous Waste Section's Sample Collection Guidance Document. Well installation was also in conformance with the North Carolina Well Construction Standards.

During the installation of each boring/well, a qualified hydrogeologist was present and a boring log completed for each well (see Appendix 3). Split spoon samples were collected at each change in lithology and where there has been a significant change in the penetration/drilling resistance. Soil cuttings were containerized until the analyses of ground water samples were received from the laboratory then appropriately disposed of.

The Hollow-Stem Auger (HSA) drilling method was used for the installation of the new monitoring wells. This method uses a hollow, steel stem or shaft with a continuous, spiraled steel flight, welded onto the exterior side of the stem, connected to an auger bit and when rotated transports cuttings to the surface. This method is best applied for soils that have a tendency to collapse when disturbed. A monitoring well can be installed inside of hollow-stem augers with little or no concern for the caving potential of the soils and/or water table. However, retracting augers in caving sand conditions while installing monitoring wells can be extremely difficult, especially since the augers have to be extracted without being rotated. If caving sands exist during monitoring well installations, a drilling rig must be used that has enough power to extract the augers from the borehole without having to rotate them. A bottom plug assembly was fastened onto the bottom of the augers to keep out most of the soils and/or water that have a tendency to clog the bottom of the augers during drilling. Potable water (analyzed prior for contaminants of concern) was poured into the augers (where applicable) to equalize pressure so that the inflow of formation materials and water was held to a minimum when the bottom plug was released. Water tight center plugs were not used because they create suction when extracted from the augers. This suction forces or pulls cuttings and formation materials into the augers, defeating the purpose of the centerplug.

The only other drilling method used was the air hammer process, which was necessary to advance MW-8 in rock. Although this well is completed in consolidated strata, it was decided that a screen and filter pack would still be utilized.

After all wells were completed, hydraulic conductivity value(s) were determined for the aquifer at each location. The results of that testing is included in Appendix 4.

All wells were constructed of Schedule 5 stainless steel casing joined by thread coupled, wire wound stainless steel screens with .010" slots. As stated earlier, with the exception of the off-site wells, which are 4" in diameter, all new monitoring wells are 2" in diameter. The design of the monitoring wells is given as Figure 3.3.

Borehole Construction

Annular Space - The boreholes were of sufficient diameter so that well construction proceeded without major difficulties. To assure an adequate size, a minimum 2-inch annular space was required between the casing and the borehole wall (or the hollow-stem auger wall). An 8-inch inside diameter auguer was used to install the 4-inch outside diameter (OD) casing used for the off-site wells. The 2-inch annular space around the casing allows the filter pack, bentonite pellet seal, and the annular grout to be placed at an acceptable thickness. Also, the 2-inch annular space allowed a 1.5-inch (OD) tremie tube to be used for placing the filter pack, pellet seal, and grout at the specified intervals. An annular space less than the 2-inch minimum was not acceptable.

Filter Pack Placement – The drillers used silica sand #2 to filter the natural soils. When placing the filter pack into the borehole, a minimum of 3-inches of the filter pack material was placed under the bottom of the well screen to provide a firm footing and an unrestricted flow under the screened area. Also, the filter pack was typically extended 2-feet above the top of the well screen when possible. The filter pack was be placed by the tremie when the potential for bridging was apparent.

Filter Pack Seal-Bentonite Pellet Seal (Plug) - A seal was placed on top of the filter pack. This seal consisted of a 30% solids bentonite material in the form of bentonite pellets. Bentonite pellets are compressed to a density of 70-80 lbs/cu.ft. Because the wells were generally less than 50 ft., the well seals were typically placed by pouring. The annular space was large enough to prevent bridging and to allow measuring (with a tape measure) to insure that the pellets have been placed at the proper intervals. Pellets were tamped while measuring to ensure proper placement. The tamping process minimizes the potential for pellet bridging by forcing any pellets, that have lodged against the borehole wall, hollow-stem auger wall, or the well casing, down to the proper interval. The bentonite seal was placed above the filter pack at a minimum of two feet vertical thickness.

Grouting the Annular Space - The annular space between the casing and the borehole was filled with a neat cement grout. The grout used was a Portland type cement grout. The grout was placed into the borehole, by the tremie method, unless the depth to the bentonite seal was shallow (less than 10 feet) in which case it was poured. It was placed from the top of the bentonite seal to ground surface, and allowed to cure for a minimum of 24 hours before the concrete surface pad was installed. The grout was prepared in accordance with the manufacturer's specifications. Typically, the cement grouts are mixed using 6.5 to 7 gallons of water per 94-lb bag of Type 1 Portland cement.

Above Ground Riser Pipe and Outer Protective Casing - The well casing, when installed and grouted, extend above the ground approximately 2 feet. An outer protective casing was installed into the borehole and above the 2 feet riser pipe after the annular grout cured for at least 24 hours. The outer protective casing are made of aluminum with a hinged, locking cap. The outer protective casings used over 2-inch well casings are 4 inches square by 5 feet long. Similarly, protective casings used over 4-inch well casings are 6 inches square and 5 feet long. All protective casings have sufficient clearance around the inner well casings, so that the outer protective casings do not come into contact with the inner well casings after installation. The protective casings should have a minimum of two weep holes for drainage. These weep holes should be a minimum 1/4-inch in diameter and drilled into the protective casings just above the top of the concrete surface pads to prevent water from standing inside of the protective casings. A protective casing is installed by pouring concrete into the borehole on top of the grout. The protective casing is then pushed into the wet concrete and borehole a minimum of 2 feet. Extra concrete may be needed to fill the inside of the protective casing so that the level of the concrete inside of the protective casing is at or above the level of the surface pad. The protective casing should extend a minimum of 2 feet above the ground surface or to a height so that the cap of the inner well casing is exposed when the protective casing is opened.

Concrete Surface Pad - A concrete surface pad should be installed around each well at the same time as the outer protective casing is being installed. The surface pad was formed around the well casing. Concrete was placed into the formed pad and into the borehole (on top of the grout) in one operation making a contiguous unit. The protective casing is then installed into the concrete as described in the previous paragraph. The size of the concrete surface pad is dependent on the well casing size. If the well casing is 2 inches in diameter, the pad should be 3 feet x 3 feet x 6 inches. If the well casing is 4 inches in diameter, the pad should be 4 feet x 4 feet x 6 inches. The finished pad is sloped so that drainage will flow away from the protective casing and off of the pad. In addition, a minimum of two inches of the finished pad is below grade to help prevent washing and undermining by soil erosion. At each site, all locks on the outer protective casings should be keyed alike.

Pictures of various monitoring well construction activities are included as Appendix 5.

3.2.4 Monitoring Well Sampling

Standard field methods were used to sample the groundwater monitoring wells. The basic process is to measure the water level; purge the well; and obtain the sample. Prior to measuring the water levels, well caps were removed and the water level was allowed to equilibrate. The measuring device (electric tape) was decontaminated between each well per standard EPA protocol. All water levels and well depths were measured to the nearest 0.01 ft. below the surveyed top of the well casing.

After measuring the wells, the wells were purged to remove stagnant water. Method blanks were taken of each sample procedure and of purging equipment to verify sample integrity. Field measurements including pH, temperature, specific conductance, dissolved oxygen and turbidity were used to verify that stagnant water had been removed. Purging continued until all field measurement values varied less than 5% for subsequent well volumes. When purging was completed, the samples were taken within a 24 hour time span.

Monitoring well sampling began on March 11, 1997; 5 days after the wells were constructed and developed. However, very high turbidity values in several wells prompted concern over improper well development. Upon verification by the contractor that only a minimal amount of time was spent developing each well, a redevelopment program was implemented. That program consisted of more aggressive techniques, including cyclical over-pumping and mechanically surging with a surge block. It became necessary therefore to break the sampling into two events. The first focused on surface water, sediment, surface soil and the landfill facility samples, and the second, which began on April 7, 1997, focused entirely on collecting samples from the monitoring wells.

The well redevelopment was successful for the majority of the wells. Understanding that the contaminants of concern have very high sorptive properties, our goal was to collect samples when the turbidity dropped below 50 NTU. To accomplish this, samples were collected with low flow perastaltic pumps whenever possible. If head conditions did not allow the use of perastaltic pumps, and if turbidity was still a problem, then the wells were sampled with a stainless steel and teflon submersible grundfoss pump. If turbidity was entirely not a concern as with the existing wells, sampling was performed with a dedicated teflon bailer. Table 3.2 is a summary of the field-sampling event and the results of field parameter testing. A discussion of the analytical results are provided in Section 4.

3.2.5 Surface Water and Sediment Sampling

The exact location of surface water and sediments were determined in the field by the Science Advisor and State representative. Eight surface water samples from Richneck Creek and the unnamed tributary were collected on March 11th and 12th. The samples are designated SW-1, SW-2, UTUS, UTDS, RCUS (above bridge), RCUS (below bridge), RCDS and RCUT. SW-1 and SW-2 are positioned to collect water as it emerges from seep features north and south of the landfill. Both samples are important for establishing surface water quality as close to the filled area as possible. The existing network was maintained for the sake of analytical comparison to prior results. The RCUS above bridge was added to allow compensation from possible water quality impacts associated with SR-1604

Stream Sediment

Nine stream sediment samples were collected along Richneck Creek and the unnamed tributary. The locations were selected to determine the quality of sediments at the base of the major surface drainage features, as well as, to determine what impact to stream sediments may originate from the upstream areas of Richneck Creek, both above and below SR-1604. This allows the road's effects to be filtered out. All samples were collected within the thick accumulation of sediments.

Sediment samples are extremely important because the substances of concern have a large affinity for soils, therefore select locations could represent an accumulation of impact. It is absolutely critical that samples be collected in areas prone to deposition and not within the center of the stream. For example, sediment sample Sed-4 was taken at the confluence of the two streams and is a potential indicator of environmental impact as it leaves the landfill area.

Standard field methods for collecting samples of flowing water and stream bottom sediments were used. Care was taken to minimize disturbance of the stream. Downstream samples taken before upstream, and all sample collection equipment and containers were carefully decontaminated by organic-free methods before use. All sampling equipment was dedicated to a location whenever possible. Subject to the amount of flow present in the stream at the time of sampling, surface water samples were obtained by standing downstream of the water to be sampled, turning the container sideways, partially submerging the container and allowing water to fill the container with minimal agitation. Floating debris was prevented from entering the sampling container.

Sediment samples were collected by using stainless steel scoops for sediment removal and laboratory decontaminated glass trays to homogenize the sample. An ample amount of soil was placed in each tray prior to mixing. At the recommendation of the EPA field representative, additional mixing was accomplished by incrementally placing soil in each analysis jar.

3.2.6 Surface Soil Sampling

Concerns were raised by the Science Advisors that potential contaminants resulting from the landfilling operations might still exist within the immediate area of the landfill. Of particular concern was deposition of wind blown PCB containing dust particulates and potential improper handling or storage of the contaminated soils prior to placement in the landfill facility.

In a field meeting held on March 11, 1997, it was decided that this potential for impact would be assessed by collecting and analyzing five strategically located surface soil samples around the landfill. The sample locations designated SURS-1 through SURS-5 were positioned as outlined below:

Summary of Surface Soil Location

SURS-1	Enclosed depression 200 feet west of the south landfill edge.
SURS-2	Suspicious piles of debris located north and west of landfill.
SURS-3	Sediment accumulation located adjacent to stormwater sediment screen approximately 10 feet east of the northeast edge of the landfill.
SURS-4	Unnatural mound of soil adjacent to the east side of the landfill.
SURS-5	Enclosed depression immediately south of the landfill's southeast edge.

The samples were collected similarly to the sediment samples and represent a mixture of the upper six inches of soil. The results of the surface soil analysis are discussed in Section 4.3.

3.2.7 Air Monitoring

Procedures used by the State to collect and analyze air samples from the landfill prior to, during and after the recent investigation activities, are included in Appendix 6.

3.3 Facility Testing Activities

3.3.1 Landfill Content

The need for more comprehensive understanding of the landfill contents prompted additional analytical testing.

The sampling associated with the most recent testing were not obtained through the central air vent but from two test borings positioned on north-south trending crest of the facility as shown on Figure 3.2.

S&ME installed the test borings under contract to the State to obtain landfill material for pilot scale feasibility testing (Appendix 7).

The samples analyzed were obtained from split spoon samples advanced through hollow stem augers. The samples obtained initially were strictly for characterization of the material's physical properties, however, a field decision was made by Science Advisors and State team to analyze samples representing the upper, middle and bottom portion of the landfill at both the north and south borings. This distribution was believed would yield a range of chemical condition in the facility. The procedures used for the sampling is further discussed in the S&ME report contained as an appendix to this document.

3.3.2 Leachate Samples

As discussed in the file review section the landfill contains a failed leachate management system. This made it significantly easier to obtain samples from the two new extraction wells installed in the north and south borings after the soil sampling was completed. The samples collected represented raw leachate and are equivalent to the inlet samples collected in the past from leachate Inlet port on the north end near the pump house.

To verify the integrity of the carbon filters, samples were also obtained from the filtration system outlet. The procedures used in the sampling event are outlined in the Site Sampling Plan. The sample locations are designated with a square on Figure 3.2. The leachate sample obtained from the north well was split with the EPA Athens laboratory. A schematic of the leachate collection and filtration system is included as Figure 2.3.

3.3.3 Sediment Basin (Pond) Samples

The purpose of these samples is to analyze surface soils from the sedimentation basin.

The sedimentation basin is located outside the main landfill fence to the north of the landfill (Figure 3.2). It can be identified as a depression in the ground that is completely vegetated by grass and some taller weeds. The sedimentation basin has never routinely held any liquid and was used only briefly during the first year following closure of the landfill. The sampling locations are numbered Pond 1 through 3 in Table 3.3 and are located at the base of the overflow pipe, the center of pond, and the discharge pipe outlet.

Standard soil field sampling method was employed. Three soil samples were taken by appropriate field collection devices, then transferred to a properly prepared and labeled container for laboratory analysis. The soil samples were taken at a depth of 3 to 5". Low levels of PCBs (near the detection limit) were found in these substrate materials in earlier sampling activities in this same basin.

3.3.4 Sand and Carbon Filtration Bed

The filtration beds are located at the northern end of the landfill near the leachate collection pipes. The filtration beds are part of the leachate water treatment system and are contained in two concrete septic type tanks. The first bed is of sand and the second is a carbon filtration bed. This system has been used to filter water periodically pumped out of the leachate collection system. One sample was taken under the protective fabric cloth in each of the two beds.

Standard soil field-sampling methods were employed. Two samples were taken by stainless steel scoops, mixed in decontaminated glass trays then transferred to a properly prepared and labeled container for laboratory. They are from underneath the filtration fabric to a depth of 3-5". Low levels of PCBs have been detected in the leachate water pumped from the landfill during prior sampling events.

Table 3.3 is a comprehensive summary of all the samples collected during this field event. It contains the sample type, designation, matrix, sample date, the Science Advisor code and the analysis run.

3.4 Top Liner Integrity

Under direct contract with the State the condition of the top liner system, was inspected by S&ME. The Science Advisors were present for all critical portions of the liner system evaluation. The evaluation which occurred immediately following the removal of soils for pilot testing and the installation of extraction wells, included:

1. Testing of physical properties of the clay and synthetic components of the cap,
2. Visual observation of the conditions of the cap materials,
3. Removal and inspection of the synthetic material, and

4. Destructive testing of the 10 mil liner material.

The liner testing activities was limited to the two areas used to install the north and south test borings. Activities were performed on a 10-ft. x 10-ft. section of the landfill cap 10-mil PVC liner. The results as determined by S&ME are presented as Appendix 7. A discussion of those results and an independent evaluation is given in Section 4.7.1.

3.5 Landfill Water Extraction Wells

As discussed in Section 2, shortly after construction, the State discovered that a significant amount of water had entered the landfill (greater than 10 ft.). In several documents written by the State, they reasoned that the most likely source of the water was rain events, which occurred during the facility construction. This possibility is completely explored in Section 4.7.2.

The 10 plus feet of water, coupled with the failed leachate system, prompted the State to install two extraction wells. The wells are completed in the borings constructed to collect soil for the pilot testing process. The detailed design of the wells is described in Appendix 7. As discussed earlier, the extraction wells were also used to collect landfill leachate samples. It is important to note that the Landfill Working Group members on several occasions expressed their desire not to have the water removed from the landfill unless it was associated with complete detoxification. To the best of our knowledge at the time of writing this report that had not occurred. Because of the hydraulic head on the bottom liner system, the existence of water in the facility greatly increases the potential for a significant discharge to occur.

As with the monitoring wells, these wells were installed using the Hollow Stem Auger drilling method. They are constructed of 6" Schedule 40 PVC. To maximize water extraction, they contain 20 ft. of screen surrounded by a fine sand filter. The two wells cover the total thickness of the landfill and are 30 ft. deep. At the surface they are connected to the synthetic liner using chemical welding and a metal strap. No protective riser was used in the construction.

3.6 Analytes and Analytical Methods

The required analytical methods for the various samples are as shown below. An independent laboratory performed the analyses for dioxin and furan samples. All other analyses were performed by the State Laboratory Environmental Science Laboratory. The analytical methods used and there corresponding MDLs are as follows.

SUMMARY OF ANALYTICAL METHODS

CONSTITUENT	SW-846 METHOD	MDL
PCB	8081/8080	Soil = 0.1 ppm/water = 0.1 ppb
Volatile Organics	8240	see Appendix 12
Semivolatile Organics	8270	see Appendix 12
Pesticides and Herbicides	8081-8141	see Appendix 12
Dioxin/Furans	8290-1311	5.0 ppq
Metals	(Various)	

An analysis of the results obtained from this testing is provided in Section 4.0.

3.7 Quality Assurance/Control Procedures

Sample Containers

The required sample containers are as listed in Appendix 2. Personnel from the Southwest Laboratories provided all containers for the Dioxin and Furan samples. The State Field Personnel provided sample containers for all remaining analyses.

Blank Samples

Although the sampling activities covered 6 days, the containers were shipped in two events. Each shipment contained a trip blank sample. The trip blank essentially contained laboratory grade organic-free water. A representative from the selected analytical lab was given the "dioxin/furan" blanks and the State preserved the remainder of the samples for each day of sampling. Equipment rinseate blanks were prepared as a means to verify that proper decontamination procedures were followed. There should be one rinseate blank per sampling media per day generated. Field decontamination between sampling is not expected to be performed therefore additional equipment rinseate blanks should not be needed. These blanks are as follows and are listed in Table 3.3.

Description	Type/Purpose
Trip 1	Trip Blank for Deliver 1
Equipment Rinseate	Check surface water sampling procedures
Drilling Water	QA/QC of water used to install wells
Equipment Rinseate	Check peristaltic pump sampling procedures
Equipment Rinseate	Check soil sampling procedures
Equipment Rinseate	Check submersible pump sampling procedures
Trip 2	Second delivery of samples
Equipment Rinseate	Check submersible pump sampling
Equipment Rinseate	Check bailer groundwater sampling equipment

Additional quality assurance measures taken included duplicate samples at MW-9 and EPA split samples at MW-3, OSW-2, Sed-5, SW-2, Pond 1, and Pond 3.

Physical Custody of Samples

Chain-of-custody shall be maintained for all samples taken from sample collection, transport and analysis by all parties involved. Sample handling was conducted as follows.

1. State field staff filled all sample containers.
2. Patrick Barnes of BFA provided all sample coding and labeling.
3. All filled sample containers for Dioxin/Furan analysis was given directly to Southwest Laboratory personnel.
4. State field personnel placed their sample identification number on each sample jar.
5. The State field staff took Non Dioxin/Furan r samples to the Environmental Science Lab

(State Lab) for analysis.

__Chain of Custody Documentation__

The Division of Waste Management uses standard forms to document sample chain of custody. Copies of the completed Chain of Custody forms are included in Appendix 8. A description of the various forms and their purpose follows:

1. Chain of custody record - this form accompanies all samples from the time they are placed in the container and labeled through shipment to the laboratory and finally accompany the data from the laboratory back to the requesting authority. This "chain-of custody" record, where each subsequent handler of the sample or data acknowledges custody and responsibility for the sample is a high-order quality control procedure.

2. Sample analysis request - this form accompanies samples from the field to the laboratory. It identifies individual samples uniquely by listing the unique sample identification number from the sample label and directs the analytical laboratory to perform the appropriate analysis on each sample. This form is filled out in advance of the sampling event.

3. Receipt of sample form - this form is used when the original sampling team releases split, duplicate, or original samples to another person or group.

4. Filed sample labeling as noted earlier was conducted by BFA. After the samples have been labeled, this information was included on the Sample Analysis Request Form in #2 above.

5. Reporting Procedure - Each laboratory performing analysis provided data, preliminary or final, simultaneously to the State and the Science Advisors.

All methods and protocols used during the Warren County PCB Landfill environmental characterization are published protocols or standards, or modifications of such necessary for the specific conditions of this effort and approved by the Science Advisors. All planned field sampling activities and subsequent chemical analyses follow or are derived from:

U.S. Environmental Protection Agency, May 1996, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM).

N.C. Department of Environment, Health, and Natural Resources, Division of Waste Management, 1993, Sample Collection Guidance Document.

Occupational Safety and Health Administration Directorate of Technical Support. 1990. Instruction CPL 2-2.20B CH-1, Chapter 1 Personal Sampling for Air Contaminants.

U.S. Environmental Protection Agency Office of Solid Waste. 1994 - SW-846. Test Methods for Evaluating Solid Waste Physical Chemical Methods.

Sampling and analysis methods not modeled after the above published standards are considered screening methods and were used in addition to, not in replacement of, the published standard. All such methods were approved by the Science Advisors.

All sampling and analysis of samples were conducted under standard chain-of-custody methods of the Division of Waste Management, which comply with all federal environmental regulatory requirements.

Section 4.0
Analysis of Field Testing Results

SECTION 4.0
ANALYSIS OF FIELD TESTING RESULTS

4.1 Site Setting and Hydrogeology

4.1.1 Regional Geology

The Warren County PCB Landfill is within the Piedmont physiographic province (Fennemon, 1928). The area is underlain by metamorphic rocks and is characterized by rolling hills and V-shaped valleys. Ridges in the area of metamorhic rocks trend north to northeast, similar to the regional structural trend of strike in the metamorphic rocks (May and Thomas, 1968). The site lies within the drainage basin of the Tar River and more locally of its tributary Fishing Creek. The site location with respect to regional geology is given in Figure 4.1.

Warren County's geology is dominated by granitic/plutons and zones of gneisses and schists which strike northeastward approximately parallel to the elongation of the granitic intrusions. In general, the zones of gneiss adjoin the areas of granite outcrop, and the schists in Warren County are east of the gneiss zone. The area north, northeast of Warrenton is an exception in that the mica schist adjoins the granite (May and Thomas, 1968). The subject site appears to lie near the boundary between the mica gneiss and mica schist zones east of Afton, N.C.

The strike of bedding plains, foliation, and cleavage in Warren County is predominantly north-northeast; the dip is predominantly northwest. These rock fabric features greatly affect the groundwater flow pathways by creating preferential zones of intergranular porosity along bedding plains, foliation, cleavage and fractures (Freeze and Cherry, 1979).

May and Thomas (1968) discuss the water bearing properties of the various rock units in their study area (greater Raleigh area). In general, wells in the mica schist are more productive than the mica gneiss. In both rock units, water follows structural features such as joints, fractures, and foliation plains. Average yield of wells in the mica gneiss was 16 gpm, and in the mica schist yield averaged 19 gpm.

Topography also affected yield of wells. Generally, wells on hills were least productive; wells in flat or sloped areas were more productive, and wells in draws (narrow, small depressions) being most productive. This correlation of well yield with the topography may be reflective of underlying geologic structure and degree of weathering of the parent rock. Hills represent areas underlain by more resistant rock and may be capped by more resistant, less fractured rocks, such as quartzite.

Weathering of the parent rocks occurs during movement and infiltration of water along structural features such as fractures, bedding plains, cleavage plains and foliation. Consequently, the more abundant and closely spaced such features, the greater the tendency of parent rock to weather and vice versa. The zone of weathering nearest unweathered parent rock may consist of large disaggregated crystals of minerals found in the parent rock with little alteration (saprolite). This grades upward into zones of more intense weathering, resulting in soil, in the common sense, which consists of clay, silt, sand and mixtures of those components.

The overview of regional geology and hydrology indicates that groundwater flow at the subject site is probably greatest within the saprolite zone in the vicinity of topographic draws.

4.1.2 Site Strata Distribution

The 142 acre site is near the nose of a NE trending ridge, whose general elevations are greater than 330 feet (NGVD). Part of the approximately 4-acre fill area are within the 340 feet (NGVD) contour which forms a small local closed high on the nose of the ridge. Surface drainage is Richneck Creek to the NW/N/NE and E and to an unnamed tributary to the S/SE.

The site is underlain by a related sequence of gneiss and mica schists, according to the North Carolina Geological Survey and the USGS report "Geology and Ground-Water Resources in the Raleigh Area, NC". Rocks that compose this complex of mica schists exhibit layering, but attitude and composition of individual zones cannot be observed in the site area because of deep weathering.

The materials above hard work are thoroughly decomposed native rock; formed in place by chemical weathering and characterized by preservation of structures that were present in the unweathered rock. These materials are also referred to as "residual soils".

Based on detailed review of the site lithology monitoring wells east and south of the facility are terminated in schist and monitoring wells west and north encounter a more genissic rock. Both schist and gneiss are metamorphic rocks produced by regional metamorphism schists, have finer grains than gneisses and there is a gradational transition between the two.

The eleven soil borings installed around the site were used to construct a map of the rock surface beneath the landfill and to develop a better understanding of the distribution of the partially weathered rock (saprolite). This is very important to understanding how groundwater will flow beneath the site, and therefore, where contaminants arising from the landfill may travel. It is believed that the saprolite zone is much more transmissive than the residual soils above.

Figures 4.2 and 4.3 are the strike and dip of the top of the saprolite zone and the top of rock surface(s) respectively. Additionally, Cross Section A-A' (Figure 4.4) gives a sectional view of the facility with respect to the site's hydrology and geology. The rock surface and saprolite both dip towards the west. The rock surface dips at a rate of 1 ft. per 12 ft. This is based on top of rock data obtained from borings at well locations 1, 4 and 10. Although the orientation of the top of saprolite is similar to that of the top of rock, it slopes at a rate of 1 ft. per 16 ft. The saprolite zone therefore becomes thicker toward the west. Because transmissivity is defined as strata thickness multiplied by permeability, the capacity to transmit groundwater and contaminants near the rock surface increases west of the landfill.

The saprolite zone is defined in this analysis as the first occurrence of 50 blows or greater per six inches on the SPT borings (see Appendix 3). The top of hard rock is defined as auger refusal. The thickness of the saprolite varies across the site from approximately 5 feet on the northeast edge to approximately 14 feet on the west edge.

The topography of the rock surface and the saprolite surface can be seen in Figures 4.5 and 4.6. Additionally, Figure 4.7 is a map showing where the saprolite is thickest.

Permeability in saprolite zone has been enhanced by weathering processes discussed, and it is commonly the most permeable zone in the vertical section. The water table commonly occurs in the overlying residual soils but may occur or fluctuate within the saprolite. Because of its higher transmissivity, this zone should be considered the most likely avenue to transmit contaminants off-site.

4.1.3 Soil Permeability and Groundwater Flow

The water table in this area is a subdued expression of the surface topography; that is, mounded under the ridge with highest gradients toward the topographically low areas. Height of this mound, which represents the water table, would depend on such factors as vertical and lateral permeability of the residual soils/saprolitic materials; distance to points of natural discharge; and duration and magnitude of recharge events. Figure 4.8 shows the groundwater mound beneath the landfill for April 7, 1997, round of water level measurements. As expected, groundwater flows radially away from the site. It is important to note however, that the highest point in the water table mound is not directly below the highest topographic relief, instead it is shifted toward the west of the facility. Although the contours indicate radial flow, meaning some groundwater will travel in all directions, the more widely spaced contours indicate areas of more rapid groundwater flow.

Recharge to the mound, or groundwater reservoir, occurs by downward infiltration through the unsaturated zone to the water table. General circulation of groundwater in this environment is downward from the water table to the zone of partially weathered bedrock, then laterally to points of areas of eventual discharge (usually streams or springs). Groundwater flows more quickly in the immediate vicinity of the facility, slows down slightly as it moves outward and then increases as it emerges in the topographic draws as surface water. Deeper circulation below the partially weathered zone is usually limited by rapidly decreasing occurrence of interconnected fractures with depth in underlying fresh bedrock. Thus the most commonly expected groundwater flow path is predominately downward from the water table to the saprolite zone, then predominantly in the lateral direction to discharge areas. Discharge has been observed as would be expected emerging from the walls of the major draws in the saprolite zone. Deviations in this idealized flow path will occur related to inhomogeneities in the residual soils and saprolite.

Location MW-10 is an upward discharge area. The water level in MW-10D is higher than that of the adjacent MW-10S, by 0.68 feet, indicating that water which recharges below the landfill discharges in this vicinity. None of the other clustered locations were definitive discharge areas.

The field permeability test performed by Environmental Investigations (Appendix 4) indicate that the permeability of the weathered rock zone ranges from approximately 2.65 x 10^{-3} cm/sec to 1.82 x 0^{-4} cm/sec for the Bower and Rice Method and 2.42 x 10^{-2} cm/sec to 3.15 x 10^{-3} cm/sec for the Hvorslev Method (using the rising head tests only). The average values for each method are 5.83 x 10^{-4} cm/sec and 1.6 x 10^{-2} for the Bower and Rice and Hvorslev Methods, respectively.

Using the equation for groundwater velocity:

$$V = \frac{K}{\eta}\frac{h}{L}$$

And the following values:

K = 45.35 ft/day (Hvorslev Method)

K = 1.65 ft/day (Bower and Rice Method)

h = 10 ft. (Height difference from recharge to discharge area)

L = 800 ft. (Distance between recharge and discharge areas)

n = .35 estimated porosity of tested zone

The approximate range of groundwater velocity across the site is .06 ft/day (22 feet per year) to 1.6 ft/day (584 feet per year) using the average permeability for the Hvorslev and Bower and Rice Methods, respectively. This is a very broad range and the actual value is probably somewhere between the two. However, given the 15 year life of this facility there has been ample time for contaminants to travel off site.

Thus, in summation, this is a very localized groundwater flow system in that all recharge to the mound underlying the ridge occurs from infiltration from the ridge, and most discharge occurs to adjacent gorge features, in particular, those to the west. Deep circulation within the bedrock to eventual discharge in more distant areas is not expected. The most probable flow path for groundwater is downward to the partially weathered zone, then predominantly in lateral direction to the nearby discharge areas. This idealized flow path may be, in part, short circuited by inhomogeneities in the materials above the partially weathered zone, in which case discharge would occur at higher elevations in the adjacent valleys.

4.2 Landfill Facility

4.2.1 Landfill Soils/Wastes

PCB Levels:

The materials inside the landfill which constitute its contents and would be the object of detoxification were found to contain PCBs at levels reasonably consistent with prior information on what was buried at the facility. However, the North Boring samples contained on average less than 100 ppm, while South Boring samples contained an average of over 250 ppm. In both borings the mid-level samples contained the highest levels of PCBs. The levels of PCBs found are generally lower than the general range most often cited by the State, which has included an average of 350 ppm and a range of 150 to almost 900 ppm. This may be a reflection of point to point variations in PCB levels within the landfill contents. It should be noted that the state laboratory testing of PCBs reported levels for Aroclor 1260 only, indicating that the levels reported are not necessarily accurate indications of total PCB levels. For example, information provided by the state said that about 61 weight percent is Aroclor 1260. If the levels found are divided by .61, then the averages become about 160 pm and 410 ppm for the North and South locations, respectively, which are somewhat more consistent with previous data.

Another indication that the state test data for PCB levels were low is the data on the raw waste samples received by ETG, one of the contractors that performed detoxification technology pilot testing. Their data on total PCB levels in two discrete samples, which seem consistent with the North and South locations, at two different heights each, reveal levels in the 260 to 465 ppm range, with no significant different between the two locations. But later more sophisticated testing for ETG found total PCB levels of 547 and 853 ppm for the North location, and 372 and 259 ppm for the South location, representing an even greater variation with the results of the site investigation. The other vendor, Eco Logic, reported total PCB levels for what were probably composited samples ranging from 200 to 260 ppm. The point of presenting these various findings on PCB levels from three sets of samples from the same two landfill locations is to show that there are undoubtedly large variations in PCB levels from one point to another within the landfill, both horizontally and vertically, rather than major problems with chemical testing.

Dioxin/Furan Levels:

The North Boring samples contained on average of about 25ppt of TEF-dioxin, with the highest level in the mid-level sample. The South Boring samples had an average of about 60 ppt TEF-dioxin, with the highest level in the top-level sample. Note that the ratio of average PCBs in the South to North locations was 2.5 and the ratio for TEF-dioxin was 2.4, indicating a logical and consistent relationship between PCB and dioxin levels in both locations. That is, the data indicate a generally higher level of toxic substances in the South Boring location. The data for the three depths within the landfill are less consistent, with no clear trend for either PCBs or dioxins with height in side the landfill. Furan congener levels were considerably greater than dioxin congener levels, which is expected for dioxin/furan impurities in PCBs.

For comparison purposes, the data from ETG for the raw waste samples indicated TEF-dioxin levels ranging from 218 to 238 ppt in the North location, and 147 to 159 ppt in the South location. Summaries of the analytical results are presented in Appendices 12 and 14.

Other Contaminants:

As to other types of contaminants, the North Boring samples contained some relatively low levels of PAHs, while the South Boring samples contained much less frequent and lower levels of this class of chemicals. These contaminants would be consistent with materials from a roadside, because road materials themselves would likely contain such chemicals.

4.2.2 Leachate

There was no indication of significant contamination in the limited leachate samples tested. PCB levels were very low, with a high of only 6 ppb. No significant levels of dioxins/furans were found, which is consistent with such a low PCB level. The EPA study of split samples found a total of 21 ppb from one of the borings in the landfill and a TEF-dioxin of only .9 ppq. The results of the EPA split analysis are contained in Appendix 15.

4.3 Offsite Groundwater

The two categories of groundwater samples are wells relatively close to the landfill that could potentially be contaminated by releases from the landfill, and background wells especially chosen to be so far from the landfill and separated by various environmental features that would preclude being impacted by the landfill. No PCBs were detected in any samples at a detection limit of .1 ppb. EPA did not detect any PCBs in three split groundwater samples.

The levels of TEF-dioxin in the background wells were very low, ranging from .02 to .1 ppq, which are consistent with background levels unaffected by the landfill.

Within wells relatively close to the landfill, TEF-dioxin levels were very low in all but two wells. In the majority of cases the levels ranged from.01 to .2 ppq, which are consistent with background levels. However, in two wells the TEF-dioxin levels were significant. In well MW-1A, the level was 37 ppq, and in well MW-5D the level was 24ppq. These are not background levels and must be considered impacts from the landfill. Both of these wells are relatively close to the landfill, with MW-1A very close to eastern boundary of the landfill, and MW-5D very close to the northern boundary.

With regard to the dioxin data for well MW-5D, it must be noted that a significant amount of 2,3,7,8-TCDD was found, namely 24 ppq, which is unusual for dioxin/furan impurities for PCBs. In MW-1A, no 2,3,7,8 was found, although the levels of the other dioxin congeners were abnormally high and inconsistent with normal dioxin/furan impurities in PCBs and with what was found in most samples in the study. On this same point, certain landfill samples used by Eco Logic were also found to have unusual levels of dioxin congeners, including one case a level of 39 ppt of 2,3,7,8-TCDD. When high levels of dioxin congeners are found it is plausible to pose the possibility that there might be a source of the dioxins other than PCBs. For example, it has been suggested that the wastes received from Fort Bragg may have been something other than normal PCB wastes. No specific data has been found in the files on exact chemical compositions of that waste. It is highly likely that the 2,3,7,8-TCDD detected in MW-5D is therefore the result of a landfill discharge.

4.4 Offsite Surface Water

No PCBs were found in surface water samples. TEF-dioxin levels in offsite surface water samples were very low, ranging from .02 to .05 ppq, which are consistent with background levels.

4.5 Offsite Soils and Sediments

In general, the data from all surface soil and stream sediment samples taken indicate no chemical contamination emanating from the landfill. No PCBs were detected in these samples.

Surface soils were tested at offsite, background well locations, and the TEF-dioxin levels were in the range of .3 to .6 ppt, which are reasonable background levels, considering ubiquitous sources of dioxins in virtually all locations in the United States that can result in surface deposition of dioxins/furans. These include, for example, various types of combustion processes and even the potential for impacts from pesticides uses in agriculture.

Soils from some well borings which constitute subsurface soil samples showed very low TEF-dioxin levels, ranging from .002 to .03 ppt, which are consistent with background levels.

Sediment samples from a number of locations were found to contain TEF-dioxin levels ranging from .02 to .2 ppt, which are very low levels that are consistent with background levels in the United States. EPA found only .15 ppt in a split sediment sample (and no PCBs).

No significant TEF-dioxin levels were found in samples from the pond areas to the north of the landfill, nor from the carbon and sand filter materials outside the northern boundary of the landfill. The actual levels found ranged from .02 to .1 ppt, which are consistent with background levels, not actual waste residues. EPA found levels of .08 and .2 ppt in two pond samples (and only 100 ppb PCBs in one of the samples).

4.6 Air Testing for PCBs

The limited data obtained by the state during the general period of the site investigation provided limited evidence of the type of air releases that could be expected from a landfill that lacked a high degree of containment efficiency. That is, releases of PCBs into the air would not be expected to be steady and regular from all places on the landfill. Instead, it would be reasonable to expect belches or puffs of releases under various conditions, and that these would be from locations where there were breaches in the surface containment system, such as holes or other openings in the top plastic liner (see Section 4.7).

Indeed, the results of state testing during February 1997 and given in the April 9, 1997 report from Southern Testing & Research Laboratories (given in Appendix 6) indicate only one major finding of PCB air releases from the landfill for the relatively short time of sampling (for some locations a maximum of about 30 hours). The one high level found cannot be dismissed as a false positive, however. In the case of Sample W-13017 very significant amounts of three different Aroclors were detected and in both the filter and sorbent components of the sampling device. The total equivalent amount of PCBs found were over 3,000 ng/m^3, which is a very high level. Later testing in March 1997 (reported in the May 30, 1997 report from the same laboratory) for only three locations did not find any detectable levels, but the limits for quantification were five times greater than in the first sampling.

Also, subsequent testing over a 24 hour period in August at six locations by EPA found no PCB releases. The EPA testing evaluated seven specific Aroclors, while the state testing only measured levels for three species.

Although some parties may interpret the air testing results as essentially finding no evidence of a major problem, it must be noted that it would have been expected that most PCB air emissions would have occurred in the past, and that only an extensive air sampling program over weeks rather than hours, using the most sensitive analytical methods, would have a high probability of detecting current actual releases. It would also be necessary to know exact environmental conditions, particularly wind directions and speeds, to fully evaluate test data.

4.7 Landfill Integrity

The Science Advisors are in strong agreement that the PCB landfill has lost its integrity and thus its ability to safeguard against future releases of PCBs and Dioxins.

4.7.1 Top Liner

As mentioned earlier, the upper liner was evaluated by S&ME under direct contract to the State. The document they produced (Appendix 7) failed to include pictures of the liner and the work activities. Appendix 8 is therefore a collection of pictures taken by BFA.

Once the 10-mil PVC liner was exposed at the north excavation, it became apparent that an extensive root mat had developed on top of the synthetic liner (Picture 1). Pictures 2 and 3 show two large holes in the liner, a pocket knife is included for scale beside one of the holes. The second hole is about 24" to the left of the one in the center of Picture 2 and is also shown in Picture 3.

Picture 3 clearly shows roots growing through the liner indicating that the holes were not caused by the removal of liner material. Such root penetration is a strong indication of water moving through the synthetic liner. The underside of the liner shown in Picture 4 shows the degree of root penetration. As the workers patch the PCV liner removed from the north excavation the extent of the wrinkles in the existing liner is obvious (Picture 5). These wrinkles may be due to improper installation settlement or a combination of both.

Pictures 6 and 7 depict the condition of the PVC liner at the south excavation. As can be seen by the trackhoe marks, proper QA/QC was not followed during final grading. The grass root activity was slightly less than at the north excavation, however, this liner section contained portions of liner seams which were not solvent welded. Field inspection of both liners revealed several smaller holes throughout the section removed.

Given that only two locations were inspected and both were in poor condition, it is likely that a significant portion of synthetic cap has lost all practical integrity. These findings are very much in line with the analysis of water entering and leaving the landfill and is more or less what would be expected for a landfill of this age. Moreover, because the thickness of the top synthetic liner was only 10 mils instead of the standard 30 mils, it is anticipated that accelerated degradation will continue.

4.7.2 Water in Landfill

In March, 1983, shortly following construction, the State reported that a significant amount of water had entered the landfill as a result of storm water events which had occurred during the construction process (September - November, 1982). By June, 1983, the State had removed 5,000 gallons of water through the leachate collection system. It is unclear whether the 5,000 gallons removed represented all the water thought to be in the landfill at that time or not. Over several subsequent years the State continued to remove small amounts of water through a largely inoperable collection system. The collection system design is given in Figures 2.3 and 2.4. Based on available data, the total quantity removed is approximately 8,000 gallons. In 1993, the State reported that the landfill contained approximately 13.5 feet of water based on water level measurements made in the leachate collection system.

A detailed analysis of water level data for both the landfill and monitoring wells surrounding the site, coupled with rainfall, was recently performed by BFA in November, 1996. This section is a paraphrase of that analysis. The data analyzed suggest a very strong correlation between the natural hydrologic cycle and the water in the landfill.

Landfill Water Level Hydrograph:

This section is for a four year period (November, 1992 to March, 1996). State staff consistently measured water levels inside and outside of the landfill.

As would be expected in a lined landfill, the peaks in landfill water level do not align with that of rainfall. Instead, they are shifted into the future (see Figure 4.9). Although this behavior is slightly masked for several smaller peaks, the highest rainfall months recorded, March, 1993, 1994 and 1995 are consistently followed by peaks in the landfill water level six months later in September. A second peak in rainfall in June, 1995, is once again followed by a very high landfill water level peak six months later in December. This regular pattern could not be coincidental. It apparently represents the period of time it takes water to travel through the top liner system, eventually reaching the landfill water table.

With the exception of the six month shift in the hydrograph, the landfill water level is behaving as would be expected for any natural system in direct connection with the environment. It has a water balance as would be expected for any flow basin. This is of note because the system was engineered to remain isolated from surface and groundwater influences. The landfill water level has consistently risen during the period of record. This rise is concurrent with the rise in the amount of rainfall, and rules out methane gas as the cause of the fluctuations observed.

Cause of Leakage:

The increased stress on the bottom liner system coupled with several other complicating factors has apparently resulted in a breach of the bottom liner integrity. Additionally, either through normal wear, manufacturing defects or improper installation, the upper composite liner of the landfill is also breached. This is evident from the discussion of the previous Section.

The 30 mil synthetic bottom liner was also severely damaged by vandalism during the early phases of construction. The damage is documented in several photographs taken by the State, and is discussed in the next Section.

Delayed Rise:

Using the groundwater velocity equation, the leakage rate across the 24" clay layer is estimated to be approximately 200 days using conservative clay permeability values. This fits very well with the approximate 6 month delayed rise in landfill water levels given by the hydrograph.

Leakage Rate:

It is assumed that the landfill materials have an average effective porosity (specific yield) of 5% or .05. The approximate 10 inch fluctuation observed over a six month period can be attributed to approximately 1/2 inch of leakage through the liner systems. For the period of record, the landfill area experienced over 45 inches of rain per year, one-half of an inch of leakage represents only ≅ 1% of the total rainfall.

Landfill Water Volume and Leakage Quantity:

The current volume of water (Nov., 1996) in the landfill based on the historical rise in water level is estimated to be approximately 320,000 gal. This represents an increase of

77,000 gallons over the 14 year landfill life or an average net increase of approximately 5,500 gallons per year.

If it is assumed that during periods of landfill water level rise only very small amounts of water is being discharged, and if it is assumed that during periods of falling water levels that only slight amounts of new leakage is coming in, then the annual inflow and outflow of water to and from the landfill can be approximated as seen below:

Estimate Water Balance

Last 3 Years of Data

	Rise and Fall in Inches				
Discharge	**Year 1**	**Year 2**	**Year 3**	**Average Inches**	**Annual Leakage Volume**
Q Out Leakage	9 (.45)	12 (.60)	12 (.60)	11.0 (.55)	25,965 gallons (.55 in.)
Q In Leakage	12 (.60)	10 (.5)	15 (.75)	12.4 (.615)	29,033 gallons (.615 in.)

Note: The decimal given in the parentheses is the amount of leakage either in or out of the landfill which is required for the observed rise and fall in landfill water level (the number immediately above it). The estimated 3,000 gallon increase per year in landfill water matches fairly well with the 5,500 gallon per year volume estimated based on the 2.5 ft. rise in water levels over the life of the facility, especially given that the State's initial height estimate was a rough estimate.

4.7.3 Bottom Liner

As can be seen from photographs 8, 9 and 10, taken during the original construction activities, the bottom liner was severely damaged by vandalism. The damage was repaired by solvent welding patches over the damaged areas. Given the lack of integrity in the top liner and that portions of that liner's seams appeared to contain no adhesive, it is assumed that breaks are also probable in the bottom liner system.

As discussed, since construction, the bottom liner system has also been under hydraulic stress associated with the water in the facility. This downward pressure increases the potential for failure.

4.7.4 The Richardson Report

The Science Advisors have examined the report prepared for the state by Gregory N. Richardson (July 30, 1997) that addressed key issues related to the landfill integrity. The following are important observations about the technical content of this report:

1. The Richardson report agrees with the findings of the Science Advisors, namely that the landfill is leaking, that water has continually entered the landfill and that water levels have followed natural seasonal variations in rainfall. He estimated that approximately 40,000 gallons per year per acre, or more than 80,000 gallons total per year have escaped. This is considerably more than the estimate presented in this report, which would result from different assumptions, particularly porosity in the landfill materials.

2. The conclusion by Richardson that the upgrading of the landfill would offer "less risk than the alternative of removal of the waste" was not based on any detailed analysis regarding relative risks of repairing the landfill versus detoxification based on excavating the landfill, and his conclusion about this risk issue is completely inappropriate and unsupported.

3. Richardson said that it was his "feeling" that the leakage to date has been harmless because of the storage capacity of the adjacent soils. But he provided no data or analysis to support his feeling. However, because the hydrogeologic system is heterogeneous and not isotrophic it is incorrect to conclude that leakage from the

landfill has not reached the groundwater table, especially because data from the current investigation has found evidence to the contrary.

4. Richardson's recommendations and cost estimate did not include a major retrofit of the leachate collection system, but assumes that the current system can be operated effectively with a low capacity pump.

5. He assumed a pinhole density of 10 holes per acre and installation defects of 30 holes per acre, which seem remarkably low based on the number of pinholes and seam defects observed by the Science Advisors in the top PVC liner.

The Science Advisors strongly believe that it is shortsighted to believe that this landfill can be repaired and made safe and effective for the long term. Detoxification is still clearly the most effective long-term solution for this facility.

Section 5.0
Conclusions

SECTION 5.0
CONCLUSIONS

5.1 Landfill Contents

The site investigation verified that there are significant levels of PCBs as well as dioxins/furans (especially when given as TEF-dioxin) in the landfill contents, but that actual concentrations of contaminants varies substantially from one point to another in the landfill, both horizontally and vertically.

5.2 Offsite Contamination (Landfill Impacts)

It is important to recognize that the current investigation used a relatively large number of sampling locations and comprehensive types of samples to reliably ascertain whether there had been major releases of toxic substances from the landfill. With the exception of two monitoring wells directly adjacent to the facility, no evidence was found for significant off-site contamination in surface waters, sediments, groundwater, and soil.

There is, however, no doubt that reliable data were found indicating some limited impact of the landfill on subsurface materials immediately outside the landfill. The contamination found in two groundwater wells surely indicates some failure of the containment system, which is consistent with observations made about water entering and leaving the landfill, as well as the findings about the loss of containment efficiency in the landfill's top liner system. The findings of contamination outside the landfill is important from the perspective of potential detoxification of the landfill, but not in terms of health threats to people, because there is no use of local groundwater for drinking water and no plausible human exposure scenario. In attempting to estimate the potential for detoxifying materials outside the landfill, it is necessary to confront two fundamental issues. One is that very limited data showing offsite contamination resulting from the landfill have been obtained. Second, actual cleanup standards may not be set so stringently as to warrant the treatment of offsite materials. Off-site contamination is most likely due to turbid groundwater flow through interconnected fractures.

In examining the levels of TEF-dioxin found in the two offsite wells, it is not clear whether any soils would actually contain dioxins/furans at levels sufficiently high to warrant cleanup. The levels found in the groundwater samples may actually reflect dioxins/furans absorbed to very fine particles of soil rather than dissolved contaminants. In fact, considering the very low solubilities of dioxins/furans it is very unlikely that the levels found reflect dissolved constituents. High turbidities were a major problem in the initial groundwater sampling. Thus, the results may reflect soil contamination. For the Phase II technology testing activity to be conducted by one of the two technology companies completing Phase I, it probably would be wise and conservative to consider the contingency of having to detoxify some amount of soil outside the landfill either in the vicinity of wells MW-1A and MW-5D and possibly underneath the landfill itself. The latter is postulated because the contamination found in the two deeper wells could be a reflection or indication of contamination beneath the landfill. It is probably reasonable for the Phase II activity to assume that as much as 25% additional material to what is inside the landfill may require detoxification.

5.3 Longer Term Environmental Impacts

Based on technical review of all the data, the detoxification goal is the only true mechanism to largely eliminate long term potential impacts. If no clean-up activities are undertaken, rain water will continue to percolate through the landfill bringing contaminants with it. If a new cap is placed on the current facility, downward percolation will be minimized, however, the seasonal rise and fall of the water table beneath the facility and vertical flow from adjacent areas will continue to flush out the contaminants which exist immediately under the facility. Figure 5.1 is a cross-sectional view of the predicted flow system. It was generated after detailed review of the hydrogeologic data. It does not represent flow in all directions, however, it clearly shows where the potential for greatest impact lies.

Given that contaminants have been identified outside of the facility, the scenario described in Figure 5.1 is very likely. Even with a new cap, this condition will worsen substantially. Moreover, the new cap will also eventually fail.

Retrofitting the leachate system with the collection pipe as is, is not likely to be very effective in removing the water from the landfill. Because of the extremely low specific yield of the soils in the facility a much more elaborate collection system included several collection pipes covering the base of the facility is needed. Use of the recently installed wells at extremely low flow rates will also aid in water removal efficiency.

Although the short term benefit of the items discussed above, namely a new surface cap and entrained water removal, is obvious, these activities by themselves will do little to guard against the more serious long term impacts.

Section 6.0
Recommendations

SECTION 6.0
RECOMMENDATIONS

Additional Testing:

It is absolutely necessary that substantial testing be conducted of materials beneath the landfill to determine with greater refinement the full extent of contamination outside the landfill that may require detoxification. This additional testing should be conducted during the Remedial Design phase of the detoxification effort, once funds are committed for detoxification. The testing of soils and groundwater beneath the landfill should be accomplished using directional drilling technology. As seen in Figure 5.1, it is likely that a higher concentration of contamination exists immediately below the facility.

Materials Outside the Landfill requiring Detoxification:

The Science Advisors recommend that the Phase II contractor use a contingency figure of an additional 25% material that may require detoxification. The Phase II contractor should also consider different cleanup standards for PCBs and dioxins, including ones consistent with actual cleanups in the federal Superfund program and with exposure scenarios corresponding to realistic risks to human health for likely land uses of the site. For several scenarios different volumes for detoxification should be considered and total costs evaluated.

Variations in Contaminant Levels within Landfill Materials:

It is recommended that the Phase II contractor recognize the substantial chemical composition variations existing in materials within the landfill. This could require blending of landfill materials prior to detoxification or design of the treatment technology to handle maximum possible concentrations of contaminants.

Water in the Landfill and Fixing of the Leachate Collection System:

The Science Advisors strongly recommend that any action taken by the State in response to the EPA requirements to address regulatory noncompliance be carefully examined for determining whether the action is effective in removing entrained water in the landfill. Volumes of water extracted should be carefully analyzed to ascertain the extent to which the leachate collection system repair is effective.

TABLES

Table 3.1
Warren County PCB Landfill
Well Construction

Monitoring Well	Casing Diameter	Casing Depth	Total Depth	Flilter Pack	Bentonite Well Seal
OSW2	4"	33.5	43.5	31.5 - 43.5	29.0 - 31.5
OSW3	4"	44.0	54.0	42.0 - 54.0	40.0 - 42.0
OSW4	4"	58.0	68.0	56.0 - 68.0	54.0 - 56.0
MW-1A	2"	32.0	42.0	30.0 - 32.0	28.0 - 30.0
MW-3D	2"	54.0	64.0	52.0 - 64.0	50.0 - 52.0
MW-4D	2"	30.5	40.5	28.5 - 40.5	20.5 - 28.5
MW-5S	2"	30.0	40.0	28.0 - 40.0	26.0 - 28.0
MW-5D	2"	52.0	62.0	50.0 - 62.0	48.0 - 50.0
MW-6	2"	49.0	59.0	47.0 - 59.0	45.0 - 47.0
MW-7S	2"	25.0	35.0	23.0 - 35.0	21.0 - 23.0
MW-7D	2"	36.0	46.0	34.0 - 46.0	32.0 - 34.0
MW-8	2"	26.5	51.5	24.5 - 51.5	22.5 - 24.5
MW-9	2"	10.0	20.0	8.0 - 20.0	6.0 - 8.0
MW-10S	2"	8.0	18.0	6.0 - 18.0	4.0 - 6.0
MW-10D	2"	66.0	76.0	64.0 - 76.0	62.0 - 64.0
MW-11	2"	30.0	40.0	28.0 - 40.0	26.0 - 28.0
MW-12	2"	26.0	36.0	24.0 - 36.0	22.0 - 24.0

Comments: *All wells completed with #2 Silica Sand, 10' of .010 slot stainless steel screen with the exception of well number MW-8 which was completed with 25' of stainless steel screen.

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Data Provided By State Staff

Table 3.2
Warren County PCB Landfill
Summary of Field Sampling Parameters (April 1997)

Monitoring Well	Temperature (°C)	pH	SC (umhos)	DO (ppm)	Turb (NTUs)	Purge Equipment	Purge Volume (gals)	Sample Equipment
OSW2	14.9	6.10	93.1	6.8	30	Teflon Bailers	40	Teflon Bailers
OSW3	12.1	5.53	249	ND	3.05	Bailer	32	Bailer
OSW4	20.6	6.14	42	4.35	35.1	Grundfos Submersible	46.8	Teflon Bailers w/ leader &nylon rope
MW-1	15	6.21	99.4	6	9.43	Bailer	18.78	Bailer
MW-1A	20.3	5.92	55	4.1	86.7	Bailer	1.575	VOAS w/ Bailer Sub. Pump w/ Teflon Tubing
MW-2	14.8	6.56	107.5	5.3	2.48	Bailer	28.6	Bailer
MW-3S	15.6	6.75	59.4	5.15	0.29	Peristaltic Pump	41.24	Peristaltic Pump
MW-3D	16	7.46	166	5	40	Peristaltic Pump	22.115	Peristaltic Pump
MW-4S	14.2	5.63	89	4.2	1.59	Peristaltic Pump	11	Peristaltic Pump
MW-4D	12.9	5.74	60	6.8	11	Bailer	40	Bailer
MW-5S	19.9	5.7	66	4.7	10.1	Bailer	3.2	Bailer
MW-5D	11.9	4.93	78.4	ND	38.3	Bailer	12.75	Bailer
MW-6	17.8	6.33	3.9	2.6	2.37	Peristaltic Pump w/ Teflon Tubing	19	Peristaltic Pump w/ Teflon Tubing & Bottle Cap Apparatus
MW-7S	21.5	5.86	67	3.7	3.36	Bailer	2.4	Sub. Pump w/ Teflon Tubing
MW-7D	12.3	6.02	57.6	ND	25.8	Bailer	9.91	Bailer
MW-8	20	5.91	57	5.18	66	Bailer	18	Bailer
MW-9	13.5	5.6	96	4.1	9.3	Peristaltic Pump	5.5	Peristaltic Pump
MW-10S	15	6.67	58.3	3.3	1	Peristaltic Pump	7.415	Peristaltic Pump
MW-10D	15.7	7.34	100.5	4.2	0	Peristaltic Pump	36.115	Peristaltic Pump
MW-11	18.7	5.81	63	4.9	93	Bailer	3	VOAS w/ Bailer Sub. Pump w/ Teflon Tubing
MW-12	11.4	5.77	83	ND	9.95	Bailer	5.5	Bailer

*ND=No Data

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Table 3.3
PCB Warren County Landfill
New Sample Designation and Analysis

Code	Identification	Matrix	Analysis	Date/Time	Comments
		QA/QC			
ADF	Blank	Water	1,2,3,4,5		Equipment Rinseate
MB	Blank	Water	1,2,3,4,5		Drilling Water
JEN	Trip Blank	Water	4	3/11/97	Day One
CBT	Blank	Water	1,2	3/12/97	Equip. Rinseate
KTB	Blank	Water	1,2,3,4,5	4/7-5:30PM	Soil Equip. Rinse
TB	Blank	Water	1,2,3,4,5	4/8-4:00PM	Sub-Pump Rinse
CAN	Trip Blank	Water	4	4/7-9:00	One Shipment on 4/9
AW	Blank	Water	1,2,3,4	4/9	Sub-Pump Rinse
JD	Blank	Water	1,2,3,4,5	4/9	Bailer Sampling Blank
		Stream Sediment			
BHB	Sed. 1	Soil/Sed.	1,2	3/11-11:30AM	Near 1st Occurrence South
CB	Sed. 2	Soil/Sed.	1,2	3/11-12:30PM	
MS	Sed. 3	Soil/Sed.	1,2	3/11-1:20 PM	
MR	Sed. 4	Sediment	1,2	3/12-11:00AM	Confluence
AR+	Sed. 5	Sediment	1,2	3/12-12:30 PM	
NCB	Sed. 6	Sediment	1,2	3/12-4:30 PM	
SD	Sed. 7	Sediment	1,2	3/12-3:45 PM	
PJR Above Br	RCUS	Sediment	1,2	3/13-2:45 PM	
CD Below B	RCUS	Sediment	1,2	3/13-2:25 PM	
		Surface Soil			
BJ	SurS-1	Soil	1	3/11	
RB	SurS-2	Soil	1	3/11	
SB	SurS-3	Soil	1	3/11	
MBR	SurS-4	Soil	1	3/11	
BR	SurS-5	Soil	1	3/11	
		Background Surface Soils			
TMSS	OSW-3	Surface Soil	1,2,3,5	4/7-10:00 AM	
LESS	OSW-2	Surface Soil	1,2,3,5	4/7 -11:30 AM	
HESS	OSW-4	Surface Soil	1,2,3,5	4/7-10:35 AM	
		Surface Water			
RSB	SW-1	Water	1,2	3/11-12:30PM	Due south of MW-6
KB	UTDS	Water	1,2	3/11-1:05 PM	
IMB	UTUS	Water	1,2	3/11-1:10 PM	
ISB	RCDS	Water	1,2	3/12	
DA Above	RCUS	Water	1,2	3/12-5:00 PM	
CA Below	RCUS	Water	1,2	3/12-5:00 PM	
DJ+	SW-2	Water	1,2	3/12-1:15 PM	
		Well Boring Soils			
PMB	Davis-BG	Soil	1,2	during drilling	@ Water Table
HM	MW-7	Soil	1,2,3,5	during drilling	@ Water Table
WM	MW-11	Soil	1,2,3,5	during drilling	@ Water Table
KM	MW-1	Soil	1,2,3,5	during drilling	@ Water Table
DM	MW-12	Soil	1,2,3,5	during drilling	@ Water Table
MM	MW-5	Soil	1,2,3,5	during drilling	@ Water Table
TM OSW-3	Davis-BG	Soil	1,2,3,5	during drilling	@ Water Table
LE OSW-2	Alston-BG	Soil	1,2,3,5	during drilling	@ Water Table
HE OSW-4	O'Neal-BG	Soil	1,2,3,5	during drilling	@ Water Table

Table 3.3 Continued
PCB Warren County Landfill
New Sample Designation and Analysis

Code	Type	Matrix	Analysis	Date/Time	Comments
Landfill Soils					
JABT*	North Boring	Soil	1,2,3,5	during drilling	Excavation/Boring
JABB*	North Boring	Soil	1,2,3,5	during drilling	Excavation/Boring
JABP*	North Boring	Soil	1,2,3,5	during drilling	Excavation/Boring
NIAT*	South Boring	Soil	1,2,3,5	during drilling	Excavation/Boring
NIAB*	South Boring	Soil	1,2,3,5	during drilling	Excavation/Boring
NIAP*	South Boring	Soil	1,2,3,5	during drilling	Excavation/Boring
DMA	SEEP	Soil	1,2,3,5	4/7-12:15 PM	Upper 6"
SLB+ Pond	3	Soil	1,2	3/13-11:40AM	
AB Pond	2	Soil	1,2	3/13-12:05 PM	
LB+ Pond	1	Soil	1,2	3/13-12:15 PM	
PJD	Sand Filter	Soil	1,2,3,4,5	3/13-10:45AM	
ADD	Carbon Filter	Carbon	1,2,3,4,5	3/13-11:00AM	
Landfill Leachate					
QAR+	no. well (inlet)	Water	1,2,3,4,5	3/13-3:30 PM	
EZM	outlet	Water	1,2,3,4,5	3/13-5:30 PM	Approximate Time
NOV	south well	Water	1,2,3,4,5	3/13-5:00 PM	Approximate Time
Groundwater					
BB	MW-1	Water	1,2,3,4,5	4/8-10:15 AM	
JDH	MW-1A	Water	1,2,3,4,5	4/9	
ALB	MW-2	Water	1,2,3,4,5	4/9-11:45 AM	
RPAB	MW-3A (D)	Water	1,2,3,4,5	4/8-12:45 AM	
RBAB+ Exist.	MW-3 S	Water	1,2,3,4,5	4/7-8:00 PM	
RPF Exist.	MW-4	Water	1,2,3,4,5	4/8-19:15	
JDW	MW-4A	Water	1,2,3,4,5	4/8-18:05	
CEH	MW-5S	Water	1,2,3,4,5	4/7-8:10 PM	CEHT Separate Bailer VOA
PSG	MW-5D	Water	1,2,3,4,5	4/7-4:30	
JOK	MW-6	Water	1,2,3,4,5	4/8-13:00	
MMM	MW-7S	Water	1,2,3,4,5	4/8-16:50	
BT	MW-7D	Water	1,2,3,4,5	4/9-10:00 AM	
CC	MW-8	Water	1,2,3,4,5	4/8-8:00 PM	
ADJ/JDA	MW-9	Water	1,2,3,4,5	4/7-1:05 PM	Note JDA = DUP
RDRJ	MW-10S	Water	1,2,3,4,5	4/7-1:05 PM	
RAJR	MW-10D	Water	1,2,3,4,5	4/7-3:20 PM	
AJ	MW-11	Water	1,2,3,4,5	4/8-5:00 PM	
ASH	MW-12	Water	1,2,3,4,5	4/9	
DRK OSW-2	Alston-BG	Water	1,2,3,4,5	4/8-12:00 PM	
RRAM OSW4	O'Neal-BG	Water	1,2,3,4,5	4/7-4:45	
+RPS OSW-3	Davis-BG	Water	1,2,3,4,5	4/8-12:30PM	

* Upper = T
MID = B
BOT = P

\+ Split Samples

1 = PCBs
2 = Dioxin
3 = BN/AE - Pesticide & Herbicide
4 = VOCs
5 = Metal

Table 4.1
Warren County PCB Landfill
Well Survey Data

Well Number	Elev. (top of case) (ft NGVD)	Depth of Well (feet)	Stick-up (feet)	March 11, 1997 Depth to Water (feet)	March 11, 1997 Elev. Water (ft NGVD)	April 7, 1997 Depth to Water (feet)	April 7, 1997 Elev. Water (ft NGVD)	Difference (feet)
OSW-2	n/a	44.94	1.78	29.01		28.64		0.37
OSW-3	*n/a*	*54.96*	*1.06*	*39.48*		*38.85*		0.63
OSW-4	n/a	68.75	2.11	44.55		44.39		0.16
MW-1A	344.26	43.37	1.58	40.75	303.51	40.22	304.04	0.53
MW-1	343.98	51.93	2.23	42.89	301.09	42.54	301.44	0.35
MW-2	329.98	46.86	2.09	33.18	296.80	32.60	297.38	0.58
MW-3 (s)	325.18	40.82	2.12	20.52	304.66	20.20	304.98	0.32
MW-3 (d)	326.32	65.58	2.24	21.61	304.71	21.35	304.97	0.26
MW-4 (s)	322.81	38.54	2.17	19.11	303.70	18.83	303.98	0.28
MW-4 (d)	323.82	41.50	1.58	20.47	303.35	20.14	303.68	0.33
MW-5 (s)	335.95	41.97	1.22	36.10	299.85	35.57	300.38	0.53
MW-5 (d)	336.09	61.39	1.20	36.23	299.86	35.90	300.19	0.33
MW-6	314.22	59.78	0.79	20.47	293.75	20.02	294.20	0.45
MW-7 (s)		37.00	1.51	32.62	303.93	32.27	304.28	0.35
MW-7 (d)		47.54	1.67	33.07	303.48	32.68	303.87	0.39
MW-8	319.62	53.16	1.94	28.35	291.27	28.03	291.59	0.32
MW-9	298.52	20.69	0.91	10.65	287.87	10.07	288.35	0.48
MW-10 (s)	305.70	19.98	1.60	5.11	300.59	5.15	300.55	-0.04
MW-10 (d)	305.61	76.70	1.95	4.40	301.21	4.47	301.14	-0.07
MW-11	339.15	42.32	1.88	36.28	302.87	35.92	303.23	0.36
MW-12	332.20	38.40	2.09	28.27	303.93	27.88	304.23	0.39

BFA

Data Provided By State Staff

TABLE 4.3 - RESULTS OF PCBs AND PESTICIDES TESTING.

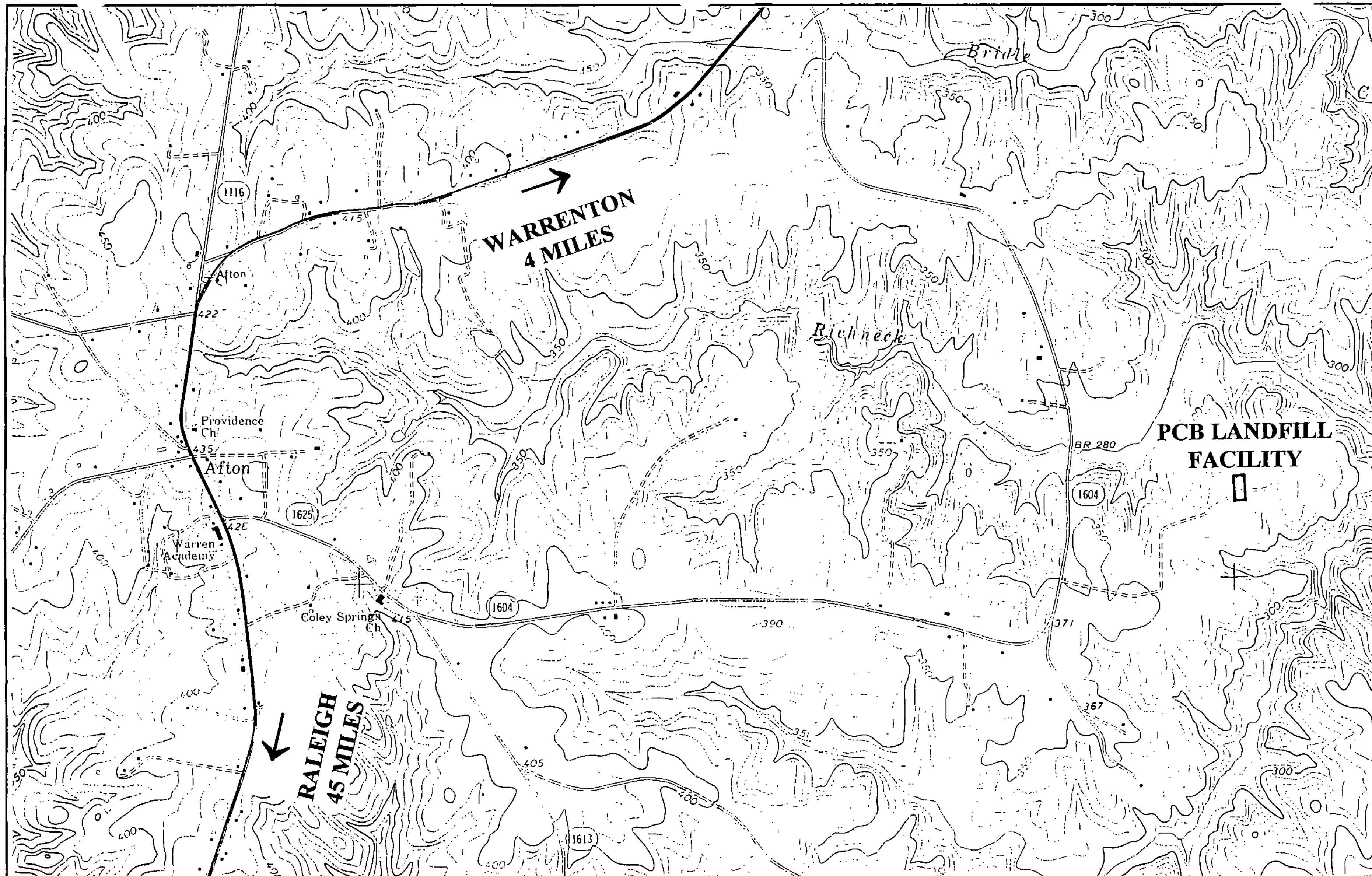
Code	Identification	PCB 1260	g-BHC (lindane)	chlordane	dieldrin	endrin	heptachlor	heptachlor epoxide	toxaphene	methoxy-chlor	2,4-D	2,4,5-TP	hexachloro benzene
QA/QC	**ppm**												
ADF	Blank	<0.0001											
MB	Blank	<0.0001	<0.0002	<0.0002		<0.0001	<0.0001		<0.002	<0.001	<0.001	<0.001	<0.0001
JEN	Trip Blank												
CBT	Blank	<0.0001											
KTB	Blank	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
TB	Blank	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
CAN	Trip Blank												
AW	Blank	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
JD	Blank	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
Stream Sediment	**ppm**												
BHB	Sed. 1	<0.10											
CB	Sed. 2	<0.10											
MS	Sed. 3	<0.10											
MR	Sed. 4	<0.10											
AR+	Sed. 5	<0.10											
NCB	Sed. 6	<0.10											
SD	Sed. 7	<0.10											
PJR Above Br	RCUS	<0.10											
CD Below B	RCUS	<0.10											
Surface Soil	**ppm**												
BJ	SurS-1	<0.10											
RB	SurS-2	<0.10											
SB	SurS-3	<0.10											
MBR	SurS-4	<0.10											
BR	SurS-5	<0.10											
Background Surface So	ppm												
TMSS	OSW-3	<0.10	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<2.0	<1.0	<0.10	<0.10	
LESS	OSW-2	<0.10	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<2.0	<1.0	<0.10	<0.10	
HESS	OSW-4	<0.10	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<2.0	<1.0	<0.10	<0.10	
Surface Water	**ppm**												
RSB	SW-1	<0.0001											
KB	UTDS	<0.0001											
IMB	UTUS	<0.0001											
ISB	RCDS	<0.0001											
DA Above	RCUS	<0.0001											
CA Below	RCUS	<0.0001											
DJ+	SW-2	<0.0001											
Well Boring Soils	**ppm**												
PMB	Davis-BG	<0.10											
HM	MW-7	<0.10	<0.2	<0.2		<0.1			<2.0	<1.0	<0.1	<0.1	
WM	MW-11	<0.10	<0.2	<0.2		<0.1	<0.1		<2.0	<1.0	<0.1	<0.1	<0.1
KM	MW-1	<0.10	<0.2	<0.2		<0.1	<0.1		<2.0	<1.0	<0.1	<0.1	<0.1
DM	MW-12	<0.10	<0.2	<0.2		<0.1	<0.1		<2.0	<1.0	<0.1	<0.1	<0.1
MM	MW-5	<0.10	<0.2	<0.2		<0.1	<0.1		<2.0	<1.0	<0.1	<0.1	<0.1
TM OSW-3	Davis-BG												
LE OSW-2	Alston-BG												
HE OSW-4	O'Neal-BG												
Landfill Soils	**ppm**												
JABT*	North Boring	44.1											
JABB*	North Boring	90.3											
JABP*	North Boring	60.7											
NIAT*	South Boring	267.8											
NIAB*	South Boring	385.7											
NIAP*	South Boring	150.5											
DMA	SEEP	<0.10	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<2.0	<1.0	<0.10	<0.10	
SLB+ Pond	3	<0.10											
AB Pond	2	<0.10											
LB+ Pond	1	<0.10											
PJD	Sand Filter	<0.10	<0.20			<0.10			<2.0	<1.0	<0.1	<0.1	
ADD	Carbon Filter	<0.10	<0.20			<0.10			<2.0	<1.0	<0.1	<0.1	
Landfill Leachate	**ppm**												
QAR+	no. well (inlet)	0.006	<0.0002	<0.0002		<0.0001			<0.002	<0.001	<0.001	<0.001	
EZM	outlet	<0.0001	<0.0002			<0.0001			<0.002		<0.001	<0.001	
NOV	south well	0.0006	<0.0002	<0.0002		<0.0001			<0.002	<0.001	<0.001	<0.001	
Groundwater	**ppm**												
BB	MW-1	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
JDH	MW-1A	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
ALB	MW-2	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
RPAB	MW-3A (D)	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
RBAB+ Exist.	MW-3 S	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
RPF Exist.	MW-4	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
JDW	MW-4A	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
CEH	MW-5S	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
PSG	MW-5D	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
JOK	MW-6	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
MMM	MW-7S	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
BT	MW-7D	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
CC	MW-8	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
ADJ/JDA	MW-9	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
RDRJ	MW-10S	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
RAJR	MW-10D	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
AJ	MW-11	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
ASH	MW-12	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
DRK OSW-2	Alston-BG	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
RRAM OSW4	O'Neal-BG	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	
+RPS OSW-3	Davis-BG	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.001	<0.001	<0.001	

TABLE 4.4 - RESULT OF DIOXIN TESTING

Code	Identification	TOTAL TEF-Adj. Concent.	Total TCDDs	Total PeCDDs	Total HxCDDs	Total HpCDDs	OCDD	Total TCDFs	Total PeCDFs	Total HxCDFs	Total HpCDFs	OCDF
QA/QC	pg/L											
ADF	Blank	**6.997E-02**	2.078U	2.370U	1.467U	**3.051**	**20.430B**	1.693U	1.530U	0.785U	**1.903**	1.088U
MB	Blank	**1.009E-01**	2.288U	2.495U	4.255U	**11.299**	**39.624B**	1.551U	1.800U	1.863U	1.163U	1.670U
JEN	Trip Blank											
CBT	Blank	**1.070E-02**	1.800U	3.060U	2.755U	2.921U	**10.695B**	2.339U	1.988U	2.023U	2.661U	2.327U
KTB	Blank	**1.010E-01**	1.409U	1.383U	0.828U	**7.200**	**25.564B**	1.092U	0.830U	0.859U	0.650U	2.462B
TB	Blank	**5.312E-01**	1.552U	1.491U	0.675U	**18.837**	**357.636B**	1.173U	0.687U	0.975U	0.988U	30.914B
CAN	Trip Blank											
AW	Blank											
JD	Blank	**8.685E-02**	2.934U	3.152U	2.027U	**4.516**	**41.691B**	2.546U	1.889U	1.305U	1.167U	2.225U
Stream Sediment	ng/Kg											
BHB	Sed. 1	**4.854E-02**	0.760U	1.464U	1.049U	**3.818**	**26.339B**	0.519U	0.530U	0.452U	0.537U	1.330U
CB	Sed. 2	**1.531E-01**	0.378U	0.672U	0.317U	**2.347**	**125.418B**	0.295U	0.240U	0.205U	**0.421**	0.180U
MS	Sed. 3	**8.586E-02**	0.169U	0.406U	0.200U	**2.998**	**69.565B**	0.126U	0.104U	0.111U	0.192U	0.238U
MR	Sed. 4	**4.417E-02**	0.392U	0.741U	0.237U	**1.728**	**34.953B**	0.277U	0.137U	0.160U	0.199U	0.138U
AR+	Sed. 5	**1.647E-01**	0.492U	0.735U	0.465U	**4.887**	**137.462B**	0.381U	0.273U	0.269U	0.426U	0.535U
NCB	Sed. 6	**8.305E-02**	0.239U	0.272U	**0.371**	**3.505**	**62.329B**	0.199U	0.116U	0.151U	**0.472**	**0.280X**
SD	Sed. 7	**8.591E-02**	0.272U	0.358U	**0.656**	**4.847**	**54.510B**	0.171U	0.147U	0.152U	**0.679**	**0.550**
PJR Above Br	RCUS	**5.967E-02**	0.198U	0.530U	0.258U	**1.463**	**45.258B**	0.176U	0.096U	0.102U	**0.256**	0.150U
CD Below B	RCUS	**1.502E-02**	0.156U	0.552U	0.251U	**5.027**	**124.561B**	0.215U	0.169U	0.136U	**0.299**	0.161U
Surface Soil												
BJ	SurS-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RB	SurS-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SB	SurS-3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MBR	SurS-4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BR	SurS-5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Background Surface Soils	ng/Kg											
TMSS	OSW-3	**5.920E-01**	0.647U	0.604U	0.500U	**9.823**	**546.099B**	0.454U	0.414U	0.334U	0.271U	0.314U
LESS	OSW-2	**2.615E-01**	0.620U	0.652U	0.596U	0.483U	**244.902**	0.612U	0.436U	0.391U	0.222U	0.453U
HESS	OSW-4	**4.542E-01**				**2.160**	**432.600**					
Surface Water	pg/L											
RSB	SW-1	**2.230E-02**	2.922U	3.573U	2.387U	2.933U	**22.301B**	3.041U	1.901U	2.189U	1.783U	3.243U
KB	UTDS	**8.941E-02**	2.356U	3.863U	2.288U	3.287U	**56.328B**	2.714U	2.658U	1.451U	2.375U	2.897U
IMB	UTUS	**4.380E-02**	3.299U	4.995U	2.800U	2.850U	**43.800B**	3.050U	3.285U	1.996U	3.221U	3.390U
ISB	RCDS	**4.904E-02**	3.811U	4.057U	3.528U	3.572U	**49.044B**	2.998U	2.820U	2.997U	4.063U	3.496U
DA Above	RCUS	**5.175E-02**	3.068U	4.071U	1.296U	2.140U	**51.753B**	2.548U	2.046U	1.266U	1.974U	1.404U
CA Below	RCUS	**5.195E-02**	2.359U	2.562U	2.254U	2.099U	**51.948B**	2.685U	1.664U	2.033U	2.125U	2.085U
DJ+	SW-2	**2.414E-02**	2.333U	3.911U	2.784U	1.334U	**24.139B**	2.142U	2.788U	2.148U	1.413U	1.655U
Well Boring Soils	**ng/Kg**											
PMB	Davis-BG	**3.175E-02**	0.195U	1.350U	0.429U	**0.572**	**24.152B**	0.132U	0.082U	0.099U	**0.201**	0.197U
HM	MW-7	**1.796E-03**	0.200U	0.342U	1.345U	0.526U	**1.796B**	0.109U	0.139U	0.573U	0.410U	0.272U
WM	MW-11	**6.366E-03**	0.248U	2.189U	0.360U	0.185U	**1.017B**	0.187U	0.142U	0.191U	**0.240**	0.112U
KM	MW-1	**3.888E-03**	0.151U	3.888U	0.824U	0.230U	**1.391B**	0.139U	0.132U	0.112U	**0.240**	***0.251***
DM	MW-12	**2.651E-03**	0.181U	0.382U	0.231U	0.230U	**2.651B**	0.126U	0.094U	0.129U	0.957U	0.135U
MM	MW-5	**2.641E-03**	0.185U	3.252U	0.544U	0.263U	**2.641B**	0.132U	0.164U	0.130U	0.097U	0.186U
TM OSW-3	Davis-BG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LE OSW-2	Alston-BG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HE OSW-4	O'Neal-BG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Landfill Soils	**ng/Kg**											
JABT* TOP	North Boring	**2.796E+01**	1.121U	5.987U	5.690U	**43.222**	**788.850B**	2.002U	**64.370**	**126.550**	**441.472**	**693.441**
JABB* MIDDLE	North Boring	**4.289E+01**	1.856U	5.374U	3.314U	**158.870**	**1657.170B**	**82.014**	**261.791**	**167.251**	**254.157**	**469.346**
JABP* BOTTOM	North Boring	**3.446E+00**	1.553U	3.335U	2.391U	**28.407**	**248.941B**	1.883U	**30.183**	**20.065**	**35.517**	**75.465**
NIAT* TOP	South Boring	**1.244E+02**	0.897U	11.536U	2.839U	4.056U	**218.649B**	**167.189**	**284.922**	**321.045**	**1881.380**	**2894.222**
NIAB* MIDDLE	South Boring	**2.533E-01**	0.205U	0.599U	0.316U	**4.204**	**76.836B**	0.235U	**3.341**	**2.599**	**2.083**	**2.290**
NIAP* BOTTOM	South Boring	**6.564E+01**	1.247U	6.787U	5.073U	**20.892**	**696.972B**	**23.103**	**61.976**	**285.380**	**1054.536**	**1414.418**
DMA	SEEP	**5.786E-02**				**1.080**	**47.030**					
SLB+ Pond	3	**1.050E-01**	0.195U	0.467U	0.280U	**3.480**	**83.466B**	0.163U	0.137U	0.145U	**0.243**	**0.276**
AB Pond	2	**1.050E-01**	0.220U	0.599U	0.280U	**3.218**	**86.271B**	0.196U	0.128U	0.129U	**0.502**	**0.430**
LB+ Pond	1	**5.483E-02**	0.226U	0.907U	0.318U	**2.970**	**31.231B**	0.189U	0.110U	0.147U	**0.910**	**1.531**
PJD	Sand Filter	**1.235E-01**	0.134U	0.477U	0.198U	**5.196**	**52.6B**	0.109U	0.114U	**0.610**	**1.591**	**2.595**
ADD	Carbon Filter	**1.604E-02**	0.259U	0.646U	0.277U	0.211U	**5.994B**	0.285U	0.165U	0.133U	**0.516**	**0.362**
Landfill Leachate	pg/L											
QAR+	no. well (inlet)		1.616U	4.475U	3.470U	**181.003**	**1407.174B**	2.663U	**14.917**	**41.777**	**94.990**	**264.533**
EZM	outlet		1.705U	3.306U	1.798U	**6.485**	**41.023XB**	1.566U	1.203U	1.172U	1.312U	**3.551**
NOV	south well		1.645U	4.045U	2.472U	**20.098**	**540.736B**	2.079U	**45.563**	**54.339**	**197.224**	**387.675**
Groundwater	**pg/L**											
BB	MW-1	**1.526E-01**				**6.770**	**48.690**			**3.290**		**4.350**
JDH	MW-1A	**3.705E+01**	1.288U	**3.428**	**178.710**	**2072.781**	**626.827B**	1.228U	**28.235**	**282.549**	**207.343**	626.827B
ALB	MW-2	**5.052E-02**				**2.870**	**21.820**					
RPAB	MW-3A (D)	**2.054E-01**	1.412U	2.739U	1.987U	**17.178**	**97.746B**	1.366U	1.949U	1.732U	1.226U	6.376XB
RBAB+ Exist.	MW-3 S	**7.895E-02**	1.771U	1.969U	0.849U	**3.945**	**18.232B**	1.415U	1.119U	0.753U	**2.127**	1.289U
RPF Exist.	MW-4	**2.111E-02**	1.539U	2.092U	2.571U	2.324U	**21.108B**	1.472U	1.349U	1.878U	3.164U	2.748U
JDW	MW-4A	**7.905E-02**	1.674U	2.532U	1.248U	**5.767**	**21.511B**	1.587U	1.260U	0.802U	**3.264**	1.472U
CEH	MW-5S	**5.545E-02**				**3.880**	**16.690**					
PSG	MW-5D	**2.412E+01**	7.472U	8.189U	3.407U	**4.593**	**31.639B**	1.547U	1.629U	0.943U	1.163U	2.213U
JOK	MW-6	**1.809E-02**	1.860U	1.732U	1.133U	2.919U	**18.087BX**	1.155U	0.805U	1.034U	1.069U	1.836U
MMM	MW-7S	**5.060E-02**	2.158U	2.065U	1.453U	**2.129**	**14.057B**	1.692U	1.351U	1.405U	1.125U	1.810U
BT	MW-7D	**8.812E-02**				**3.200**	**17.640**				3.850	
CC	MW-8	**2.232E-01**				**7.520**	**99.020**				**4.120**	**7.740**
ADJ/JDA	MW-9	**2.271E-01**				**10.360**	**87.530**				**3.040**	**5.650**
RDRJ	MW-10S	**8.626E-02**	3.982U	2.432U	1.510U	**4.947**	**16.819B**	2.443U	1.290U	1.553U	1.254U	3.163U
RAJR	MW-10D	**1.044E-01**	1.953U	2.070U	1.198U	**4.518**	**30.483B**	1.720U	1.451U	1.148U	1.356U	1.785U
AJ	MW-11	**1.638E-01**				**7.490**	**54.260**		**3.470**			
ASH	MW-12	**1.309E-02**					**13.090**					
DRK OSW-2	Alston-BG	**2.936E-02**					**29.360**					
RRAM OSW4	O'Neal-BG	**1.963E-02**	1.828U	3.757U	1.842U	2.161U	**19.627BX**	1.896U	1.596U	1.022U	0.971U	1.658U
+RPS OSW-3	Davis-BG	**1.008E-01**	1.780U	2.286U	1.461U	**7.379**	**36.990B**	1.146U	0.915U	1.075U	1.167U	1.359U

NOTES: U = UNDETECTED; X & I = EMPC; B = POSSIBLE BLANK CONTAMINATION.

FIGURES



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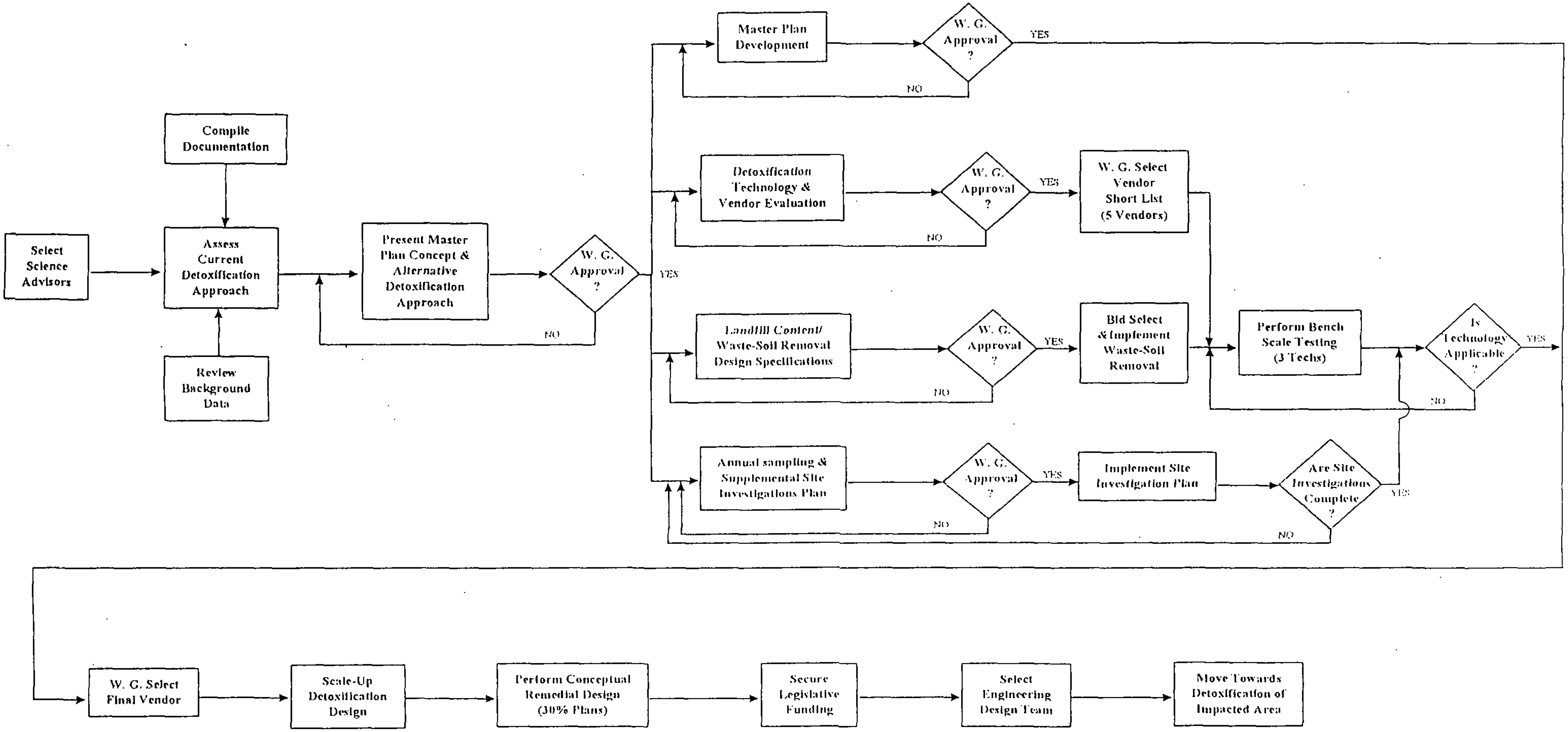
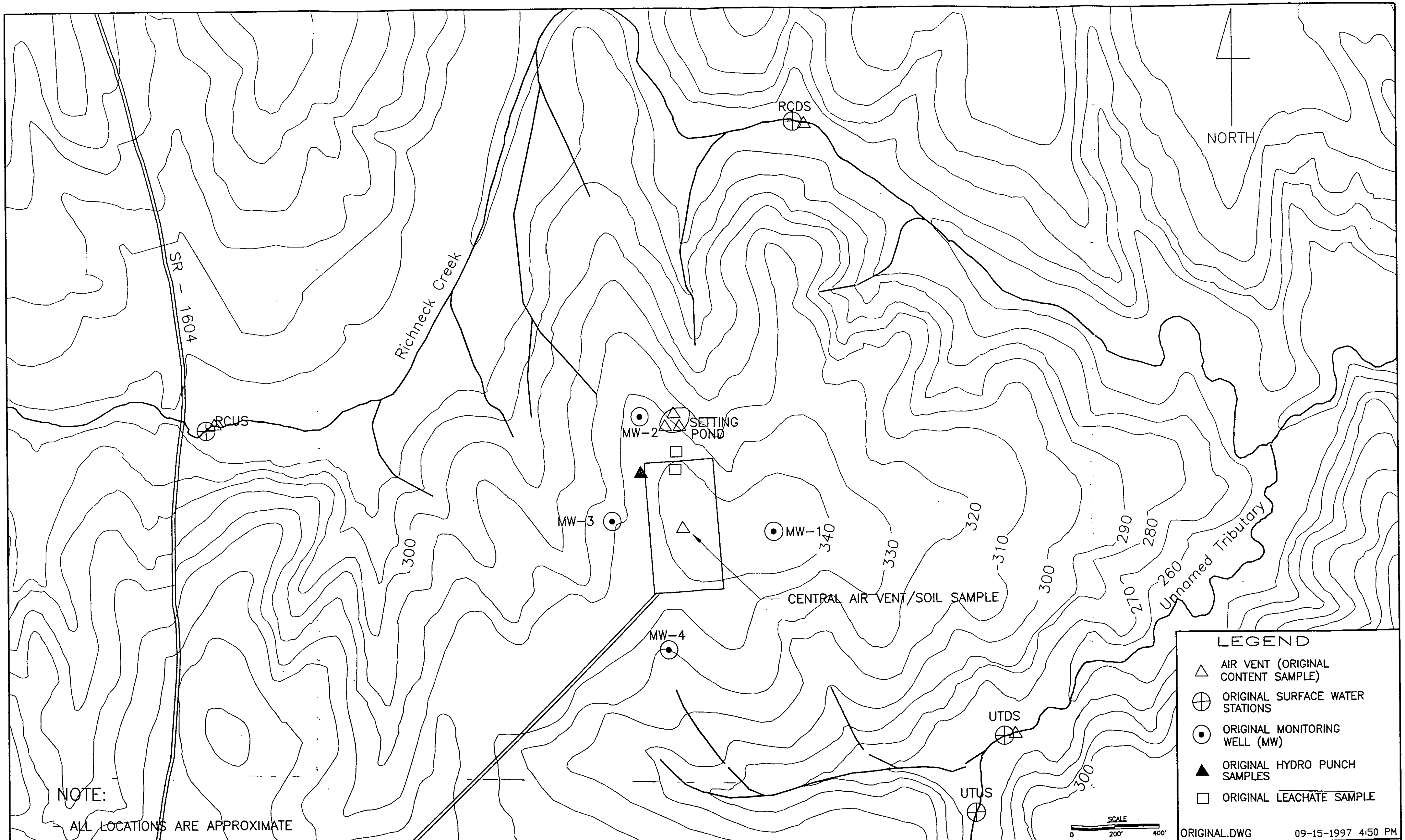
LOCATION MAP

FIGURE 1.1

FIGURE 1.2
CONCEPTUAL FLOW DIAGRAM OF THE PCB LANDFILL DETOXIFICATION MASTER PLAN PROCESS



BFA



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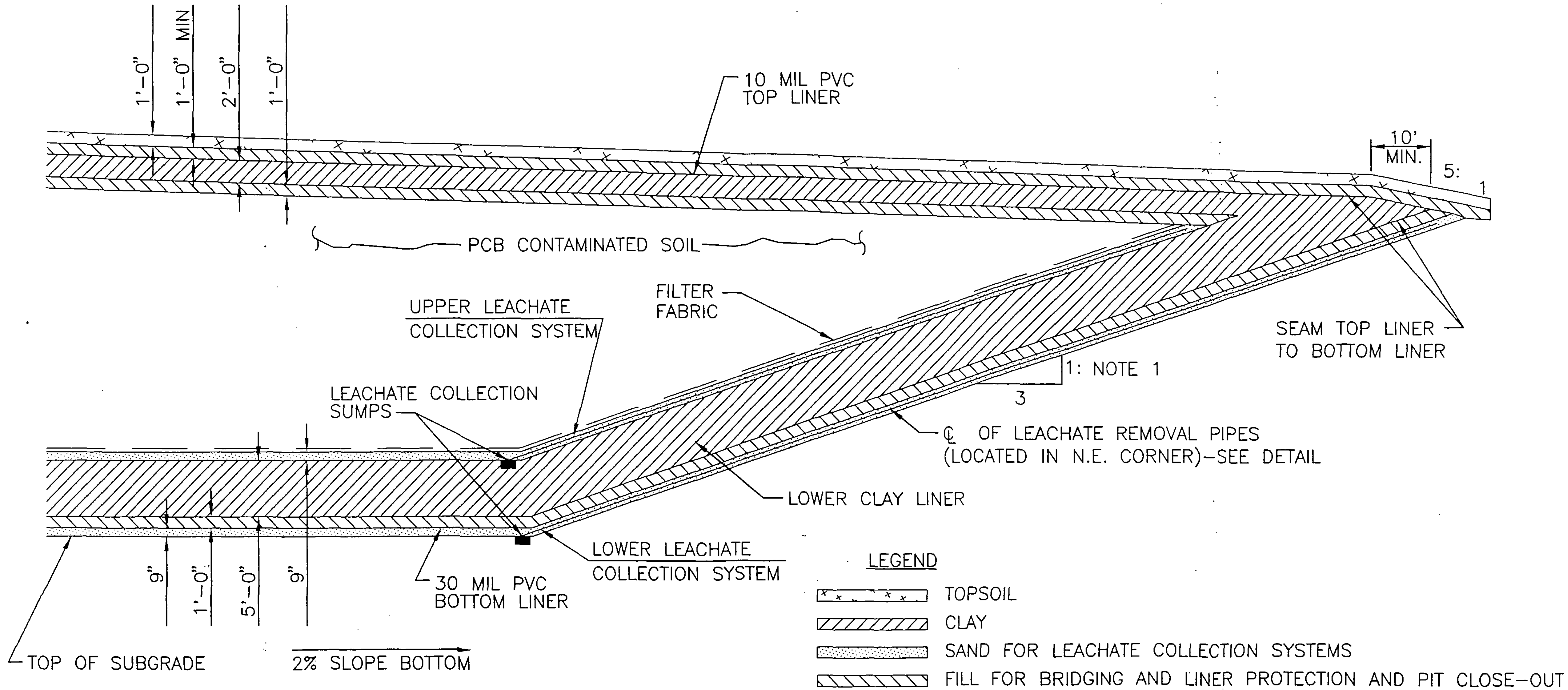
FACILITY MONITORING LAYOUT
PRIOR TO CURRENT INVESTIGATION

FIGURE
2.1



NOTE 1: SLOPE VARIES BETWEEN 3: AND 5:1.

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09-15-1997 2:08 PM

TAKEN FROM SVERDRUP PARCEL

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FACILITY DESIGN

FIGURE 2.2

IN EACH TANK OVERLAY ALL PREFORATED OUTLET PIPES WITH 1/8" MASH GALVANIZED SCREEN

INLET AND OUTLET PIPES - CAP ALL ENDS
PIPES TO BE PREFORATED AS NOTED AND SHOWN BELOW
INLET PIPES FOR:

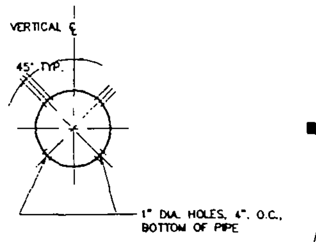
SAND FILTER-
2 ROW OF 1" DIA. HOLES EQUALLY SPACED IN PIPE, 16 HOLES PER ROW, 32 HOLES TOTAL

CARBON FILTER -
2 ROWS 1" DIA. HOLES EQUALLY SPACED IN PIPE, 14 HOLES PER ROW, 28 HOLES TOTAL & 1-1" DIA. HOLES PER PIPE SECTION FOR DRAINAGE

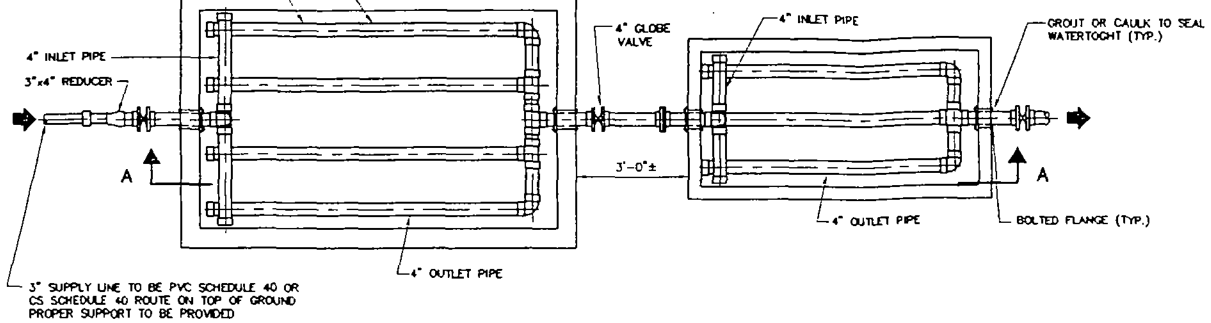
STANDARD REINFORCED CONCRETE SEPTIC TANKS

VOLUME GALLONS	INSIDE DIMENSIONS	THICKNESS	
		SIDES	BOTTOM
750	7'-6"x3'-8"x5'-3"	0'-6"	0'-4"
1500	9'-6"x5'-8"x5'-9"	0-8"	0'-5"

NOTE:
CARBON FILTER SYSTEM LEFT IN PLACE AT CLOSE OUT FOR STATE USE.

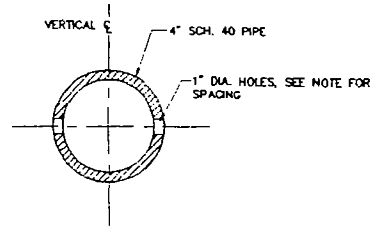


OUTLET PIPE
N.T.S.



SAND FILTER
(1500 GALLON TANK)

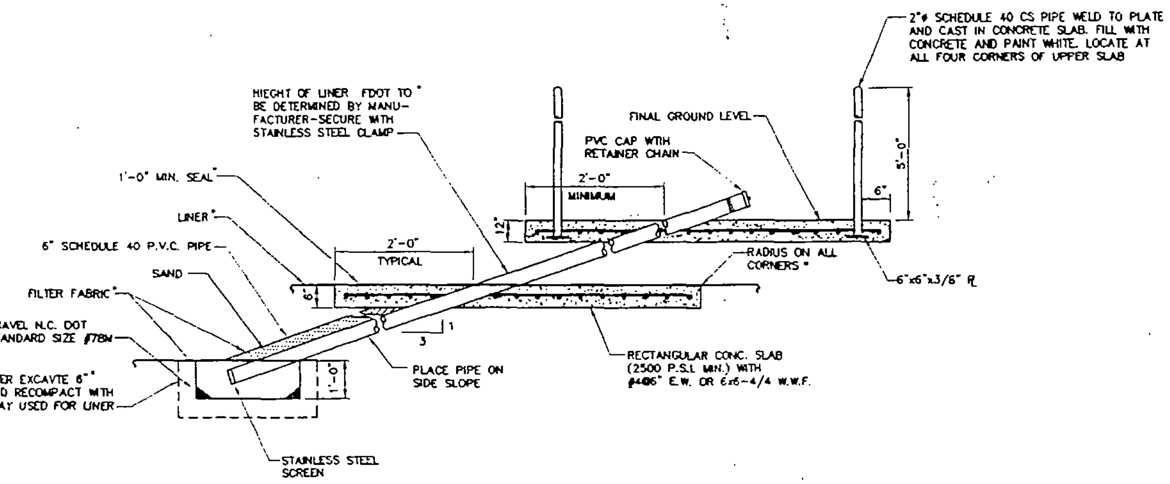
CARBON FILTER
(750 GALLON TANK)

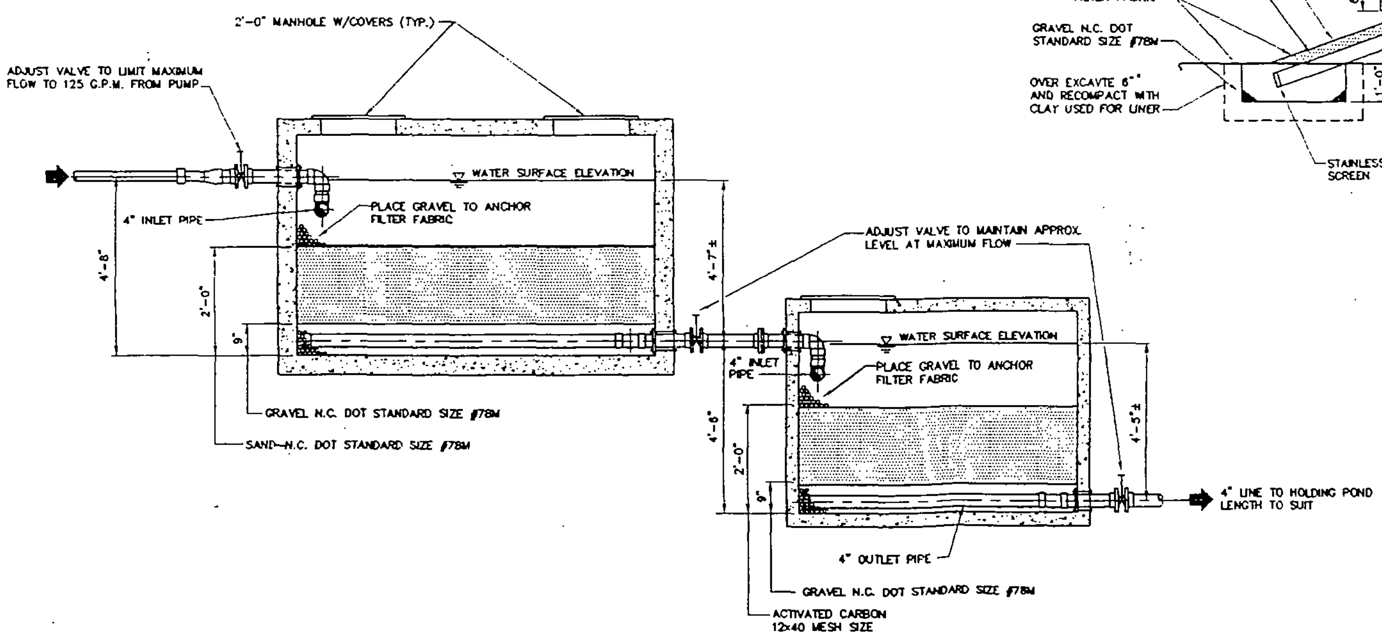


INLET PIPE
N.T.S.

NOTE:
TANK TOPS NOT SHOWN FOR CLARITY

SAND FILTER & CARBON FILTERS PLAN VIEW
N.T.S.





SECTION A-A
N.T.S.

NOTE: TAKEN FROM SVERDRUP & PARCEL, 1982

NO.	REVISIONS	BY	DATE	SURVEY DATA	DATE		DATE
				BOOK NO. PGS.		RIGHT-OF-WAY CHECKED BY:	
				SURVEYED BY:		STRUCTURE NOTATION CHECKED BY:	
				GRADES CHECKED BY:			
				BENCHMARKS BY:			
				ALIGNMENT CHECKED BY:			

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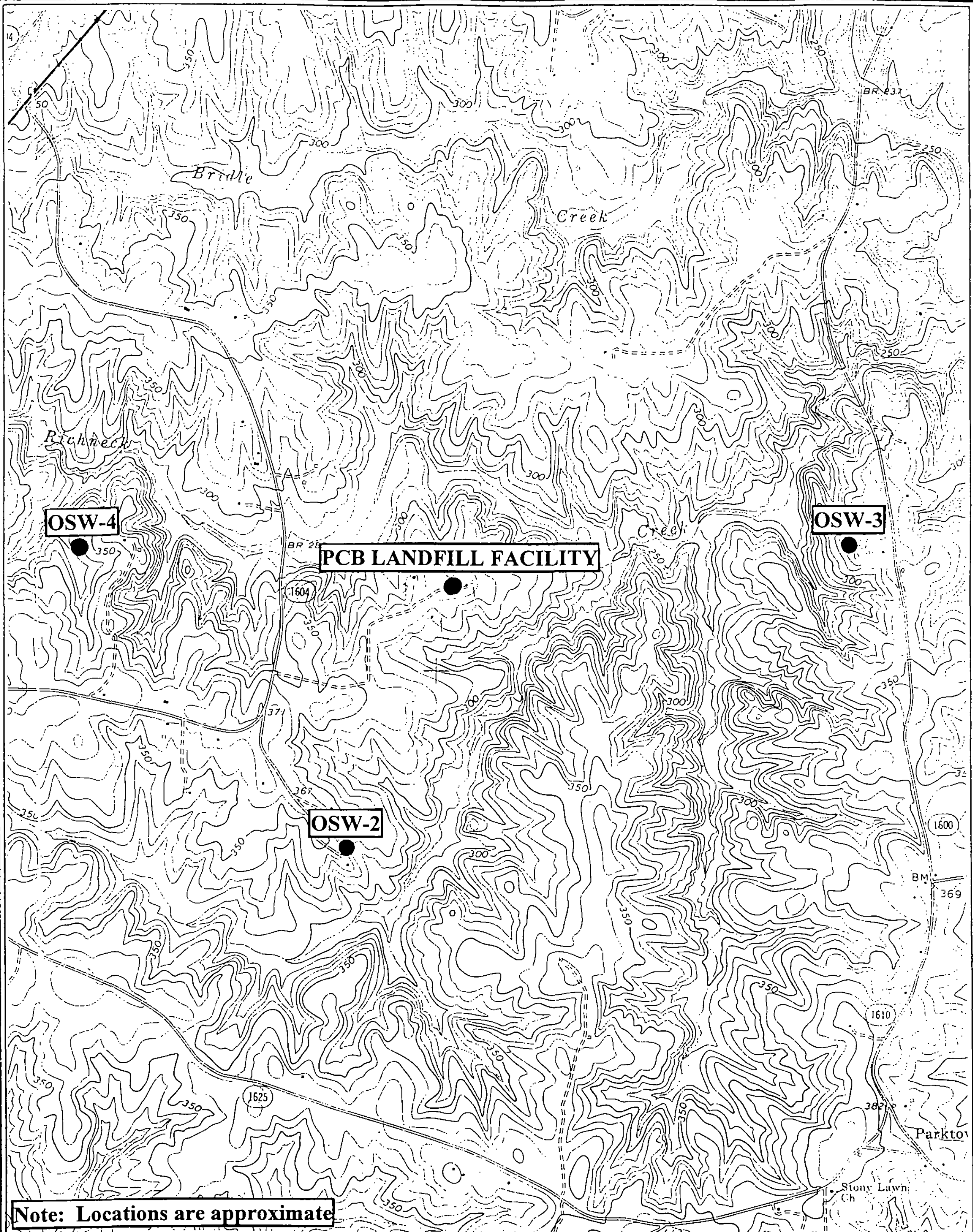
PH: (407) 896-8608 FAX: (407) 896-1822

DESIGN ENGINEER
-
FLORIDA REGISTRATION NO.

DRAWING INFORMATION	DATE	DRAWING NO.
PROJECT NO.: 95-017		23
DESIGNED BY: SEE NOTE	1982	
DRAWN BY: TC	SEP. 1997	
CHECKED BY: PAB	SEP. 1997	
DRAWING FILE: CARBON_FILTER SCALE: N.T.S.		SHT. _ OF _



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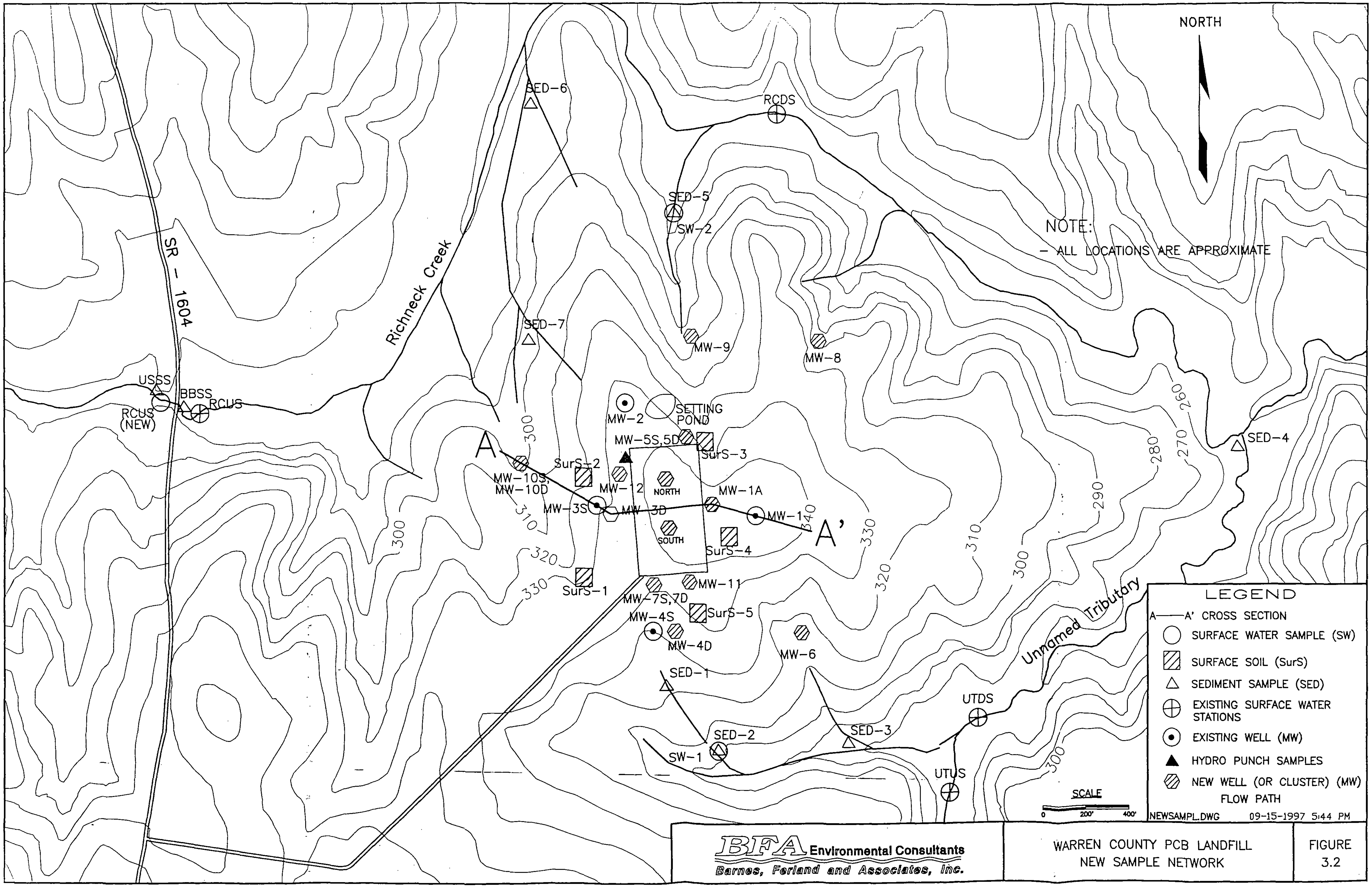
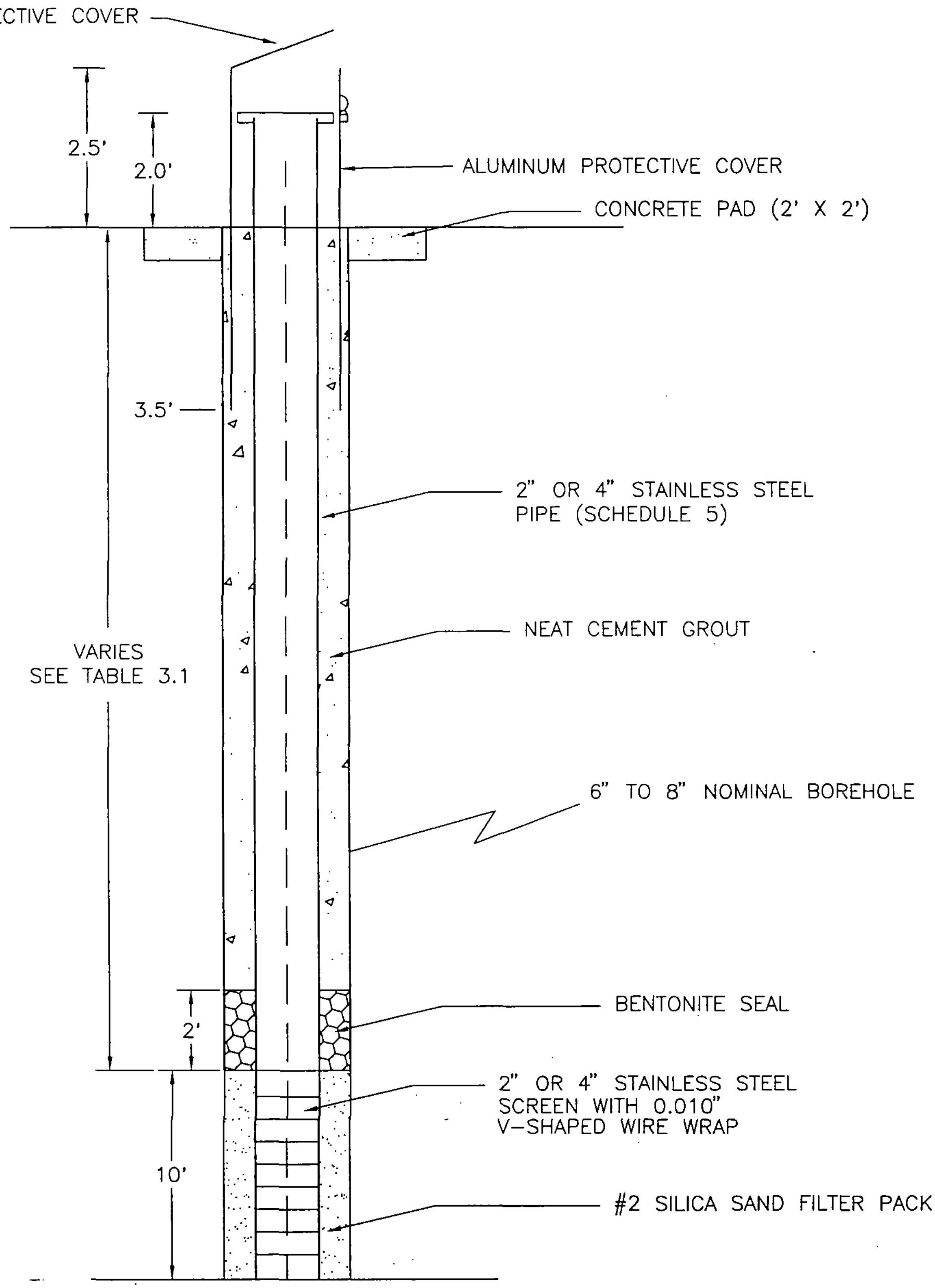
Offsite (Background) Monitoring Wells

Figure 3.1



WARREN COUNTY PCB LANDFILL
NEW SAMPLE NETWORK

FIGURE 3.2



SCALE : NOT TO SCALE

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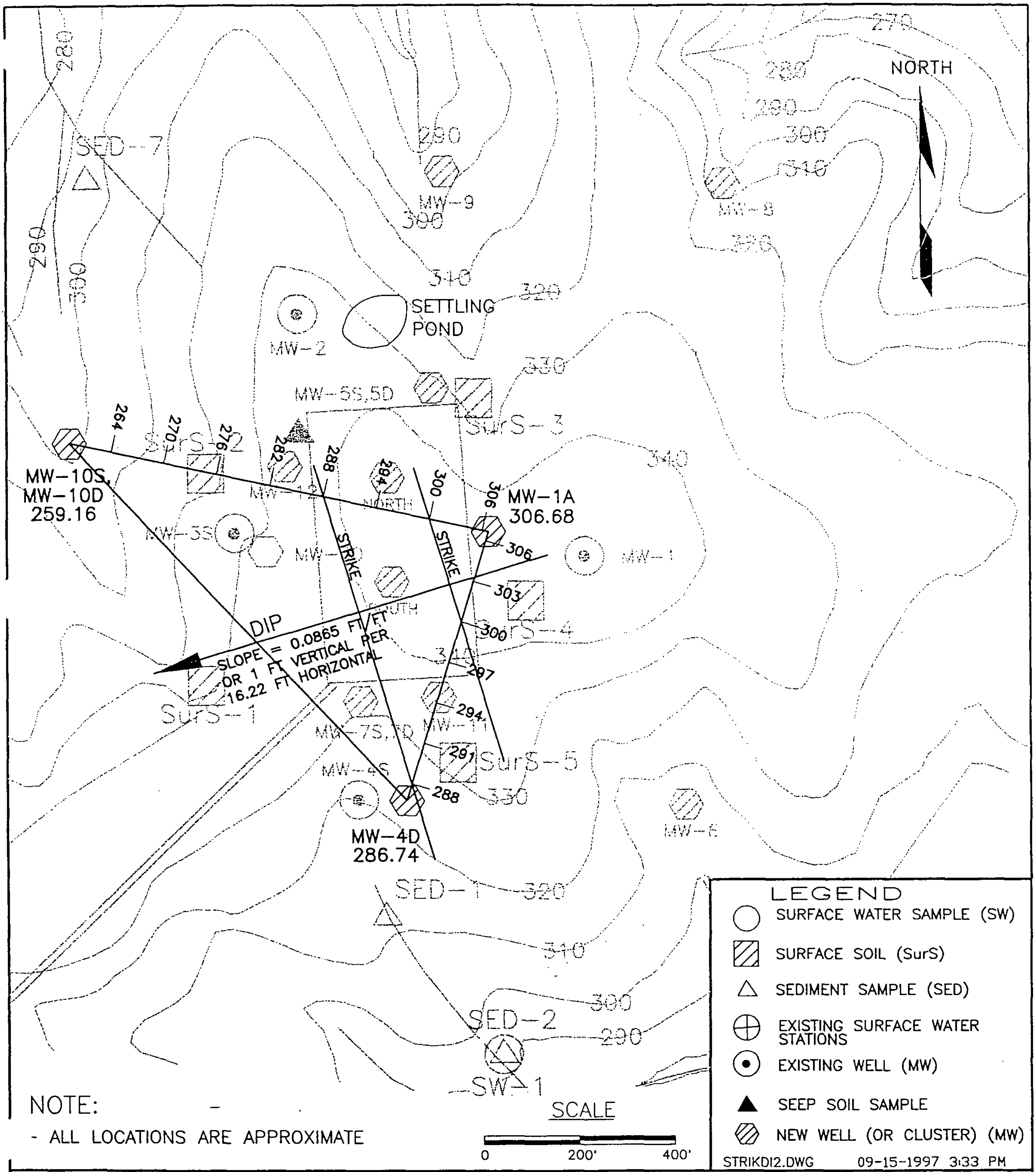
GENERALIZED MONITORING WELL DESIGN

FIGURE 3.3



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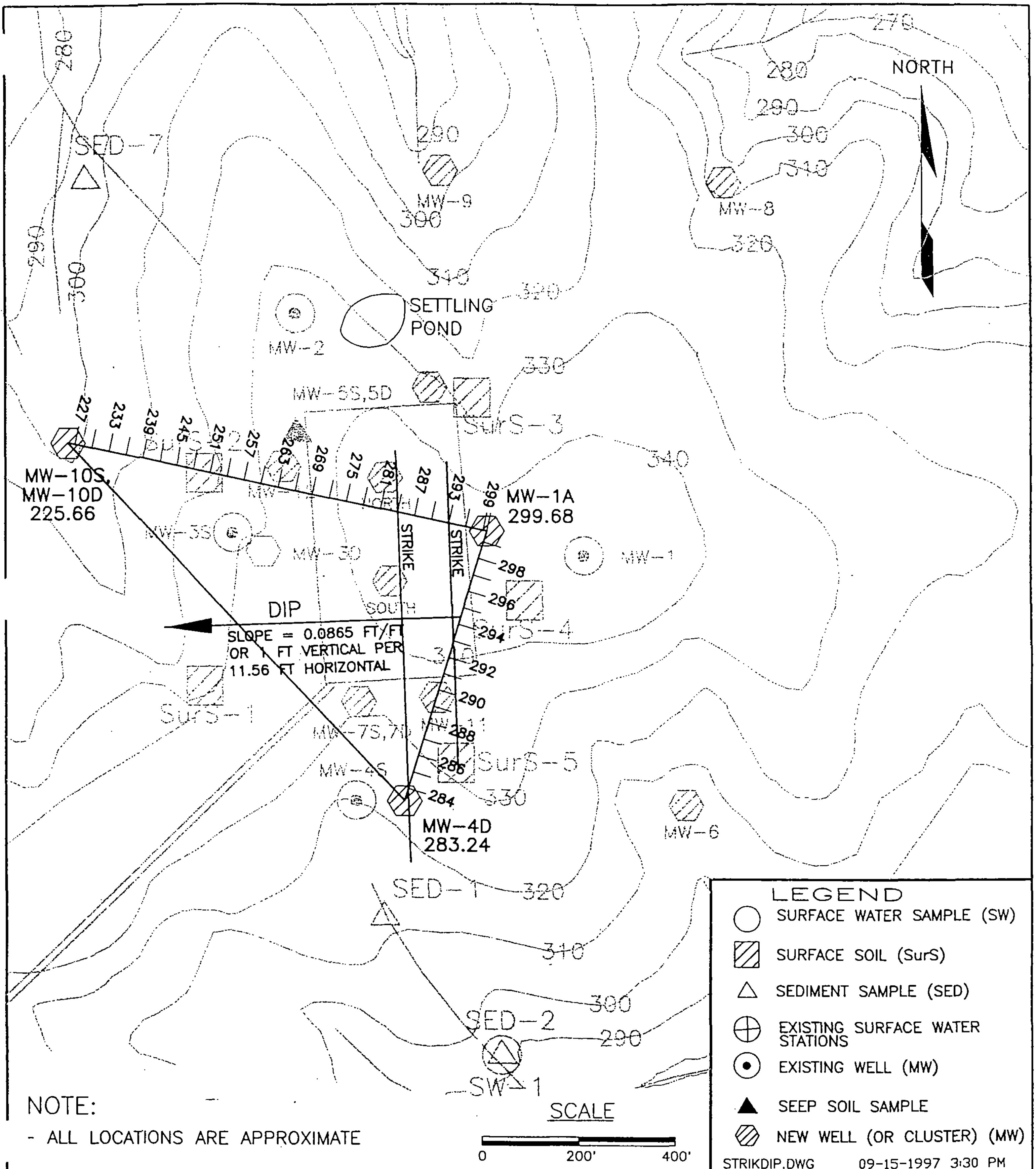
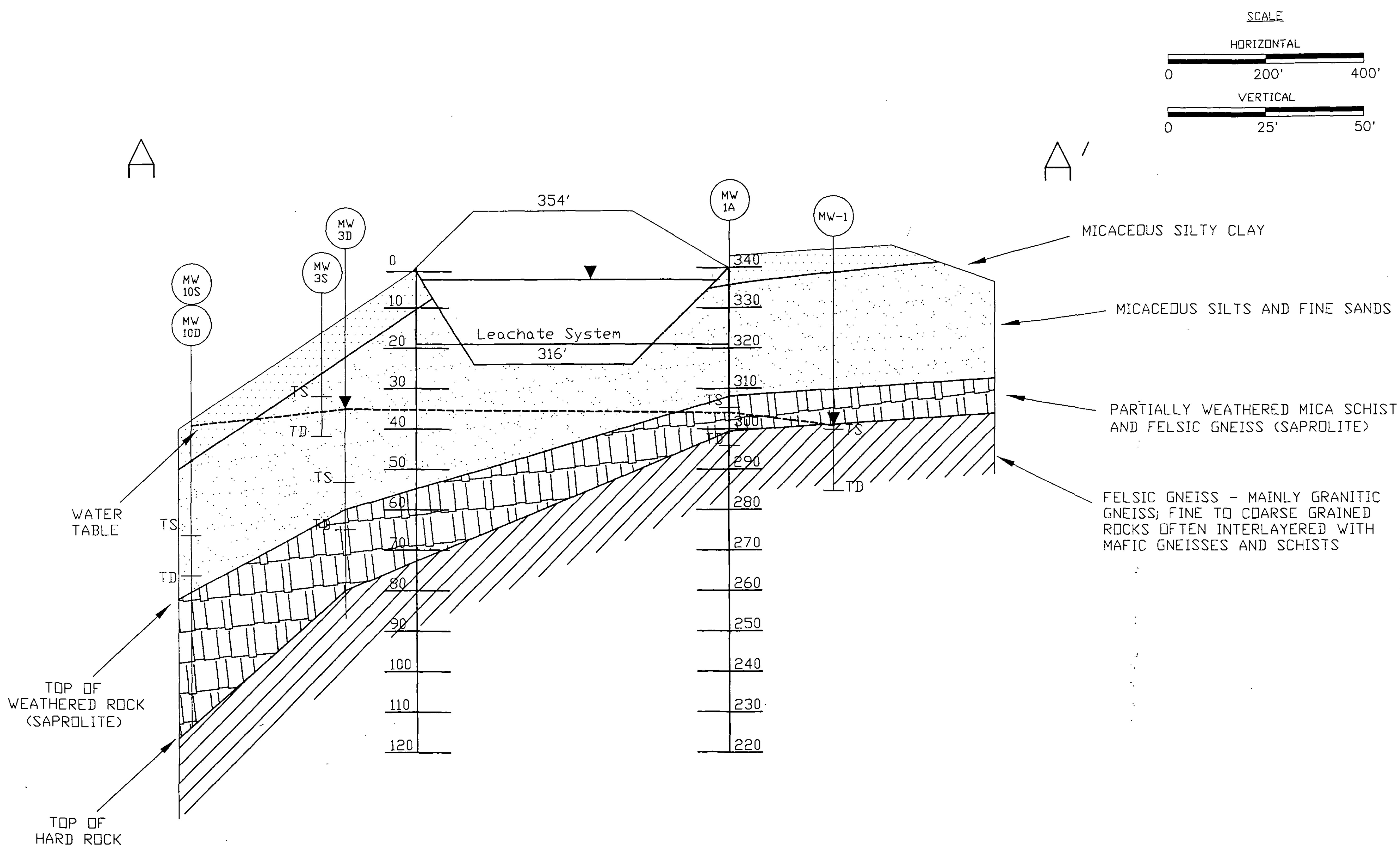
WARREN COUNTY PCB LANDFILL
STRIKE AND DIP OF WEATHERED ROCK
IN FEET NGVD

FIGURE 4.2



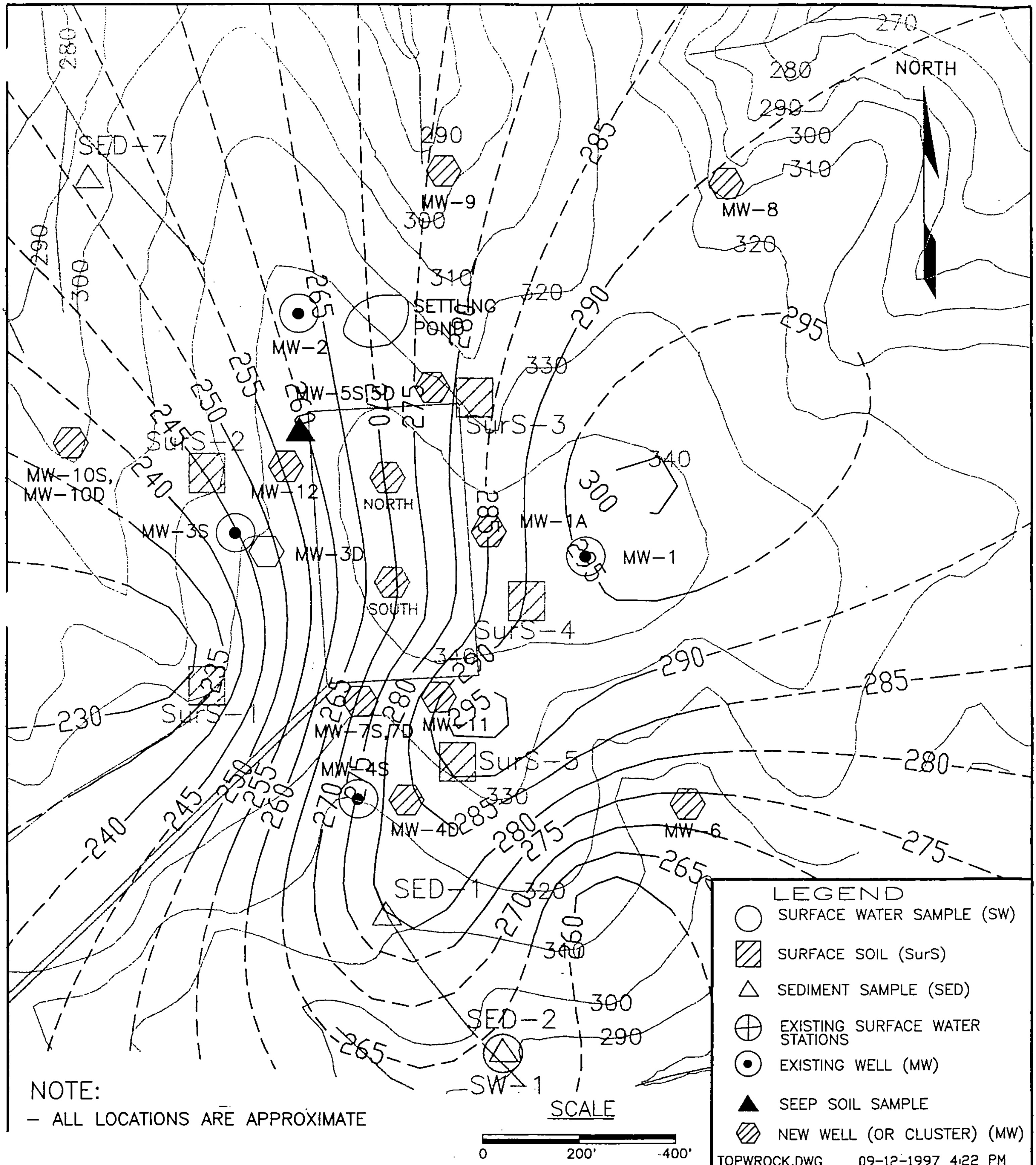
BFA Environmental Consultants Barnes, Ferland and Associates, Inc.	WARREN COUNTY PCB LANDFILL STRIKE AND DIP OF HARD ROCK IN FEET NGVD	FIGURE 4.3



NOTE: Well Water Level Measurements taken on April 7, 1997.

09-16-1997 5:34 PM

BFA Environmental Consultants Barnes, Ferland and Associates, Inc.	GENERALIZED A-A' CROSS SECTION OF THE WARREN COUNTY PCB LANDFILL	FIGURE 4.4



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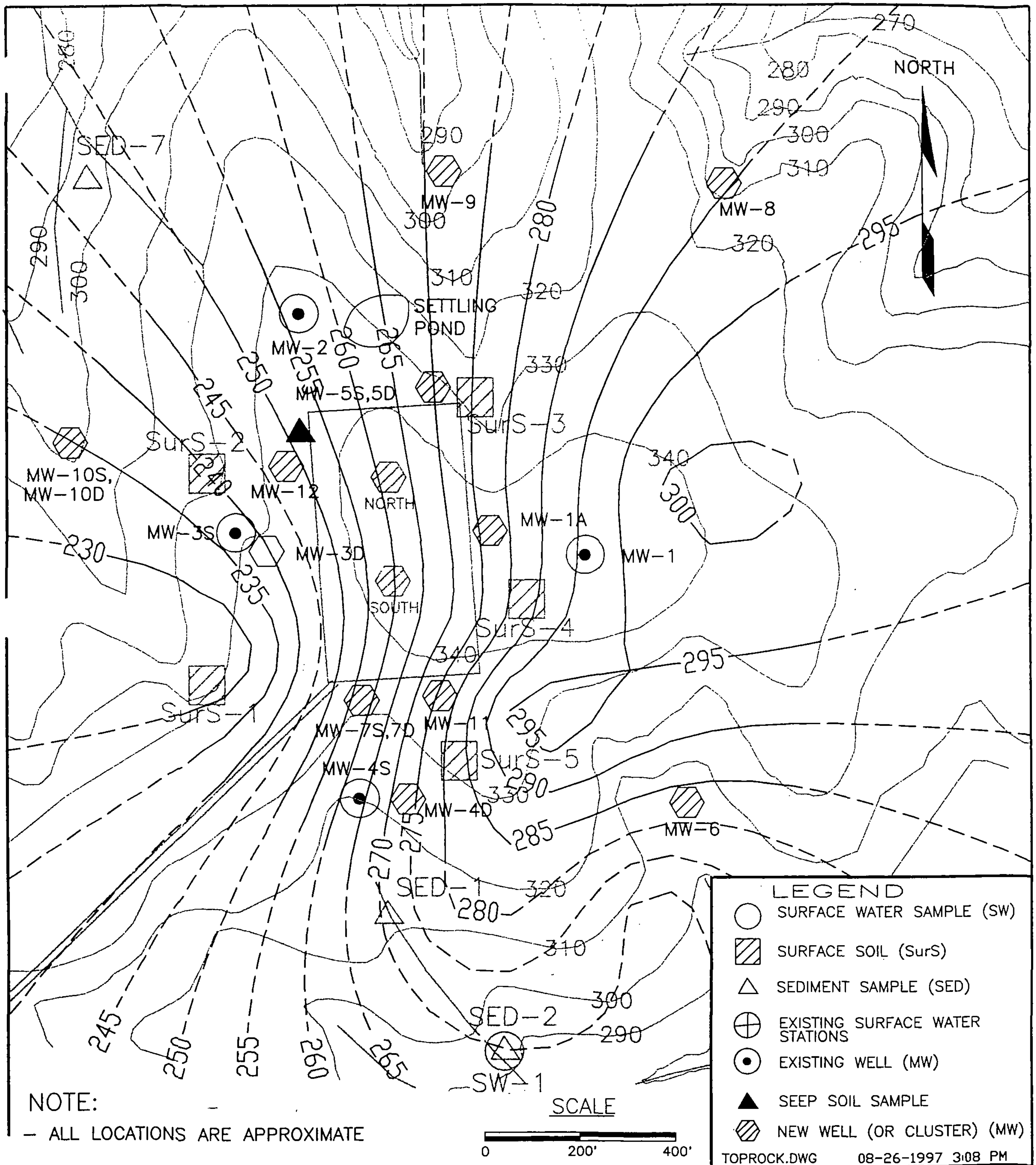
WARREN COUNTY PCB LANDFILL
TOP OF WEATHERED ROCK ELEVATION
IN FEET NGVD

FIGURE
4.5



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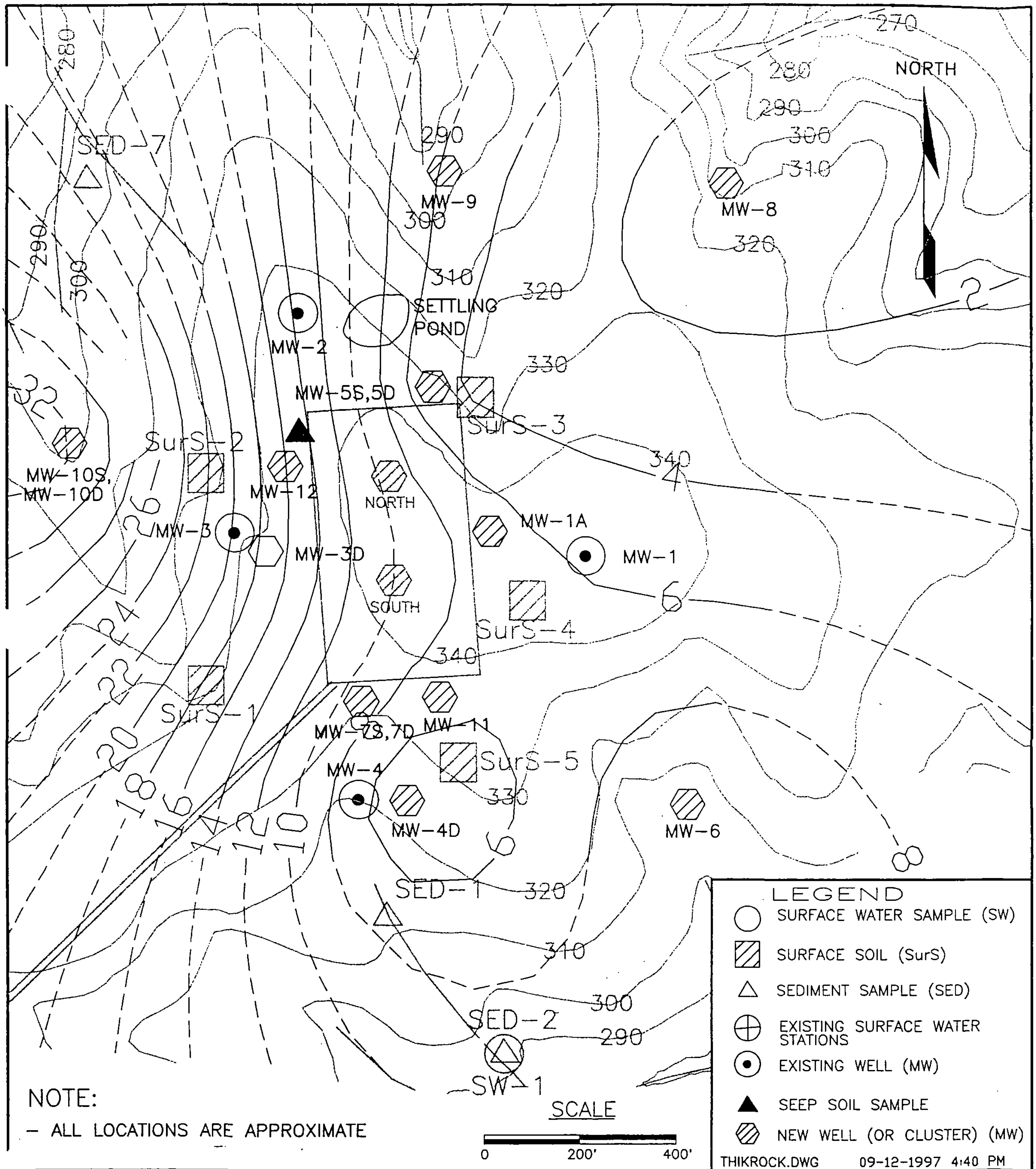
WARREN COUNTY PCB LANDFILL
TOP OF HARD ROCK ELEVATION
IN FEET NGVD

FIGURE 4.6



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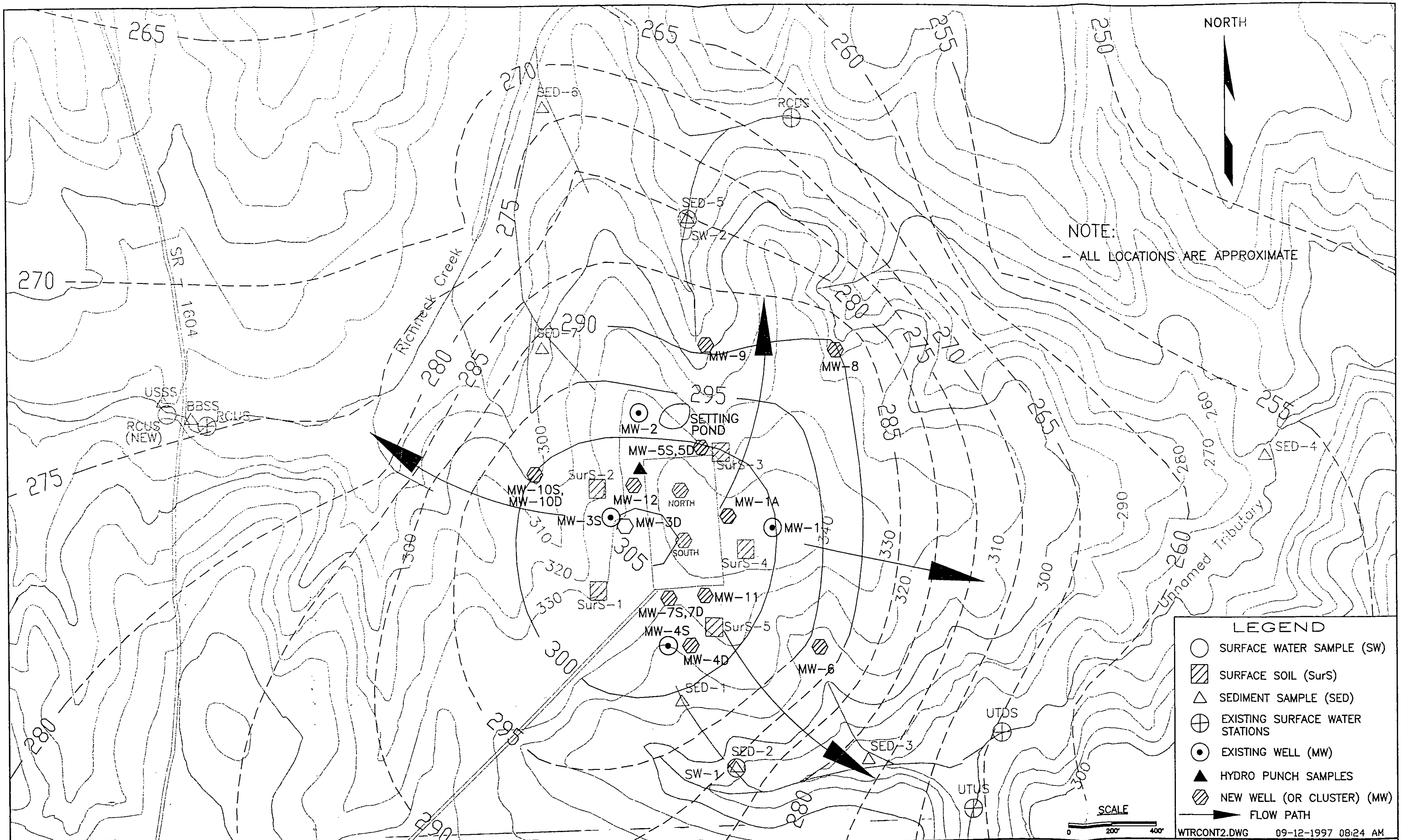
WARREN COUNTY PCB LANDFILL
THICKNESS OF WEATHERED ROCK
IN FEET NGVD

FIGURE 4.7



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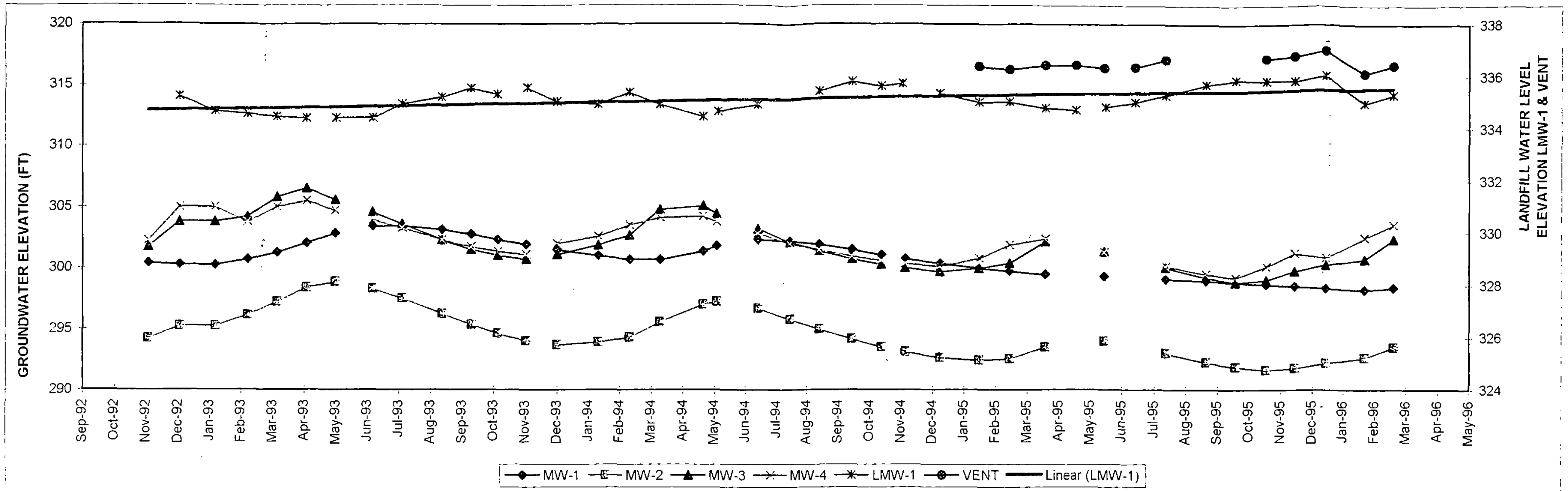
WARREN COUNTY PCB LANDFILL
WATER LEVEL CONTOURS IN
FEET NGVD (4/7/97)

FIGURE
4.8

PCB LANDFILL
GROUNDWATER AND LANDFILL WATER ELEVATIONS



WARREN COUNTY RAINFALL DATA (ARCOLA STATION)

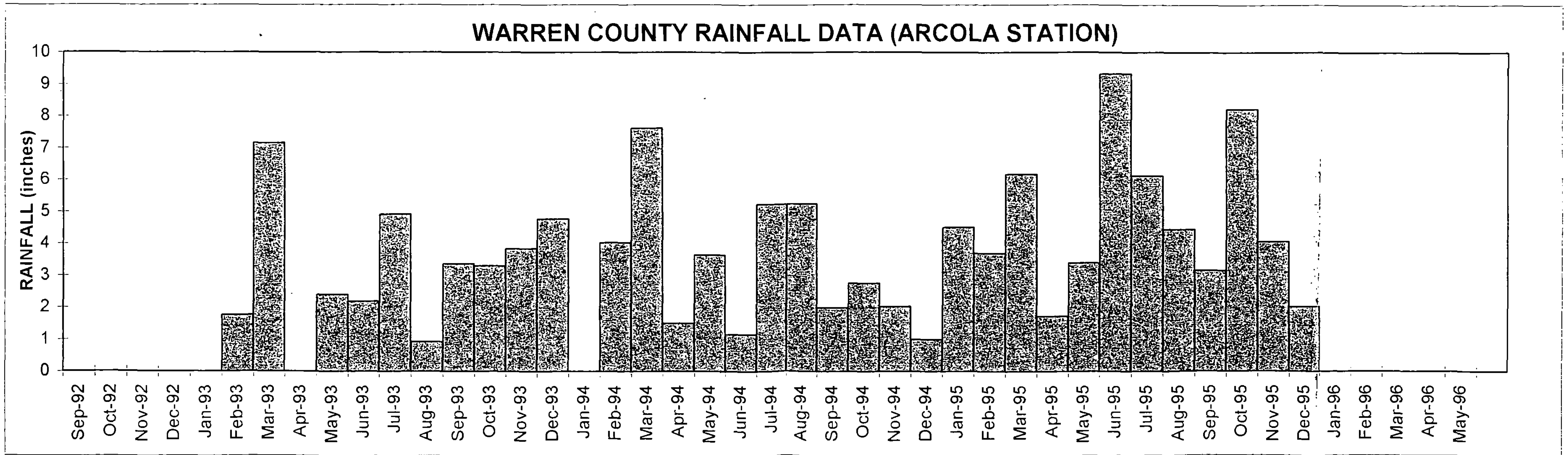


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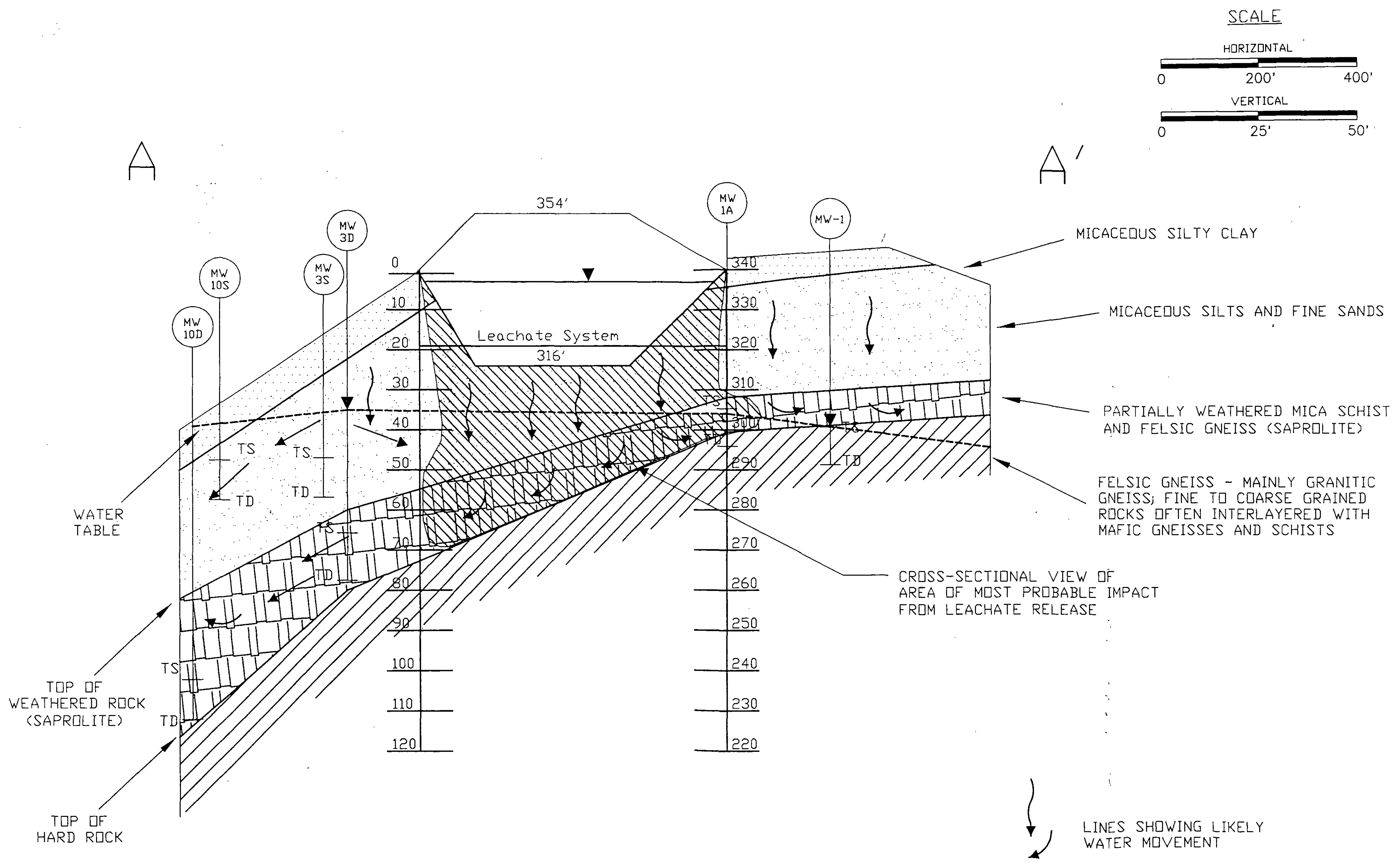
Figure 4-9

Note: Months without data represent incomplete or missing USGS rainfall data



SECTA-A.DWG
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NOTE: WELL WATER LEVEL MEASUREMENTS TAKEN ON APRIL 7, 1997

BFA Environmental Consultants Barnes, Ferland and Associates, Inc.	GENERALIZED CROSS SECTION VIEW OF POTENTIAL IMPACT	FIGURE 5.1

Appendix 2
Project Personnel Sampling Equipment

Appendix 1
Project Technical Memorandums

[illegible] to Warren County PCB Landfill
1997 Sampling Event

February

		3	4	5	6	7	10	11	12	13	14	17	18	19	20	21	24	25	26	27	28
SOLID WASTE	Larry Rose														9	8	5				
	Brad Atkinson																				
	Wendy Peacock																				
	Bill Seasons																				[illegible]
HAZ WASTE	Gary Stephens																				
	Rod McDaniel																	13	13		
	Pete Doorn																		12	12	
	Larry Stanley																				
	Doug Roberts																				
	Rosemarie Roberts												15	13							
	Tom Walker										9.5							12			
	Tracy Johnson																12				
	Pierre Lauffer																				
	Sandra Moore																				
	Rachel Grover													13	13						
SUPER FUND	Doug Rumford						10														
	Stuart Parker																				
	Keith Snavely									12	9.5										
	Rusty H-B																				
	Doug Moore																				
	L. Stanley																				
	Al Zinn	0.5								1.5			5.5	9.5	8	2.5					
	S. Kent																				
	Dave Lilley													6							

March

		3	4	5	6	7	10	11	12	13	14	17	18	19	20	21	24	25	26	27	31
SOLID WASTE	Larry Rose					6		9	9	8											
	Brad Atkinson																				
	Wendy Peacock																				
	Bill Seasons																				
HAZ WASTE	Gary Stephens																				
	Rod McDaniel								11												
	Pete Doorn																				
	Larry Stanley																				
	Doug Roberts											10	15								
	Rosemarie Roberts							13		11											
	Tom Walker	13	13	13	14			12	12	12											
	Tracy Johnson	12							12	13											
	Pierre Lauffer																				
	Sandra Moore																				
	Rachel Grover																				
SUPER FUND	Doug Rumford							13	14	11											
	Stuart Parker							13	12												
	Keith Snavely							8									12		12		
	Rusty H-B							13		11			3					2			
	Doug Moore																				
	L. Stanley								11		11										
	Al Zinn	1	8.5	8.5	4	2.5	12	13	14	12	10	9.5	8.5	8.5					2.5		
	S. Kent							13	12				3					2			
	Dave Lilley	12																			

April

		1	2	3	4	7	8	9	10
SOLID WASTE	Larry Rose								
	Brad Atkinson					12			
	Wendy Peacock								
	Bill Seasons								
HAZ WASTE	Gary Stephens								
	Rod McDaniel								
	Pete Doorn								
	Larry Stanley					11	12	7	
	Doug Roberts						15		
	Rosemarie Roberts								
	Tom Walker								
	Tracy Johnson								
	Pierre Lauffer								
	Sandra Moore								
	Rachel Grover								
SUPER FUND	Doug Rumford					15	13	13	
	Stuart Parker								
	Keith Snavely								
	Rusty H-B					14	14	13	
	Doug Moore					15	12	6	
	L. Stanley					12	10	10	
	Al Zinn		0.5		6.5	16	15	12	9
	S. Kent								
	Dave Lilley								

14	15	16	17	18	Misc.	TOTAL
						54
						12
					97	97
				10[illegible]		168
					Sub Total	331
					93	93
						37
						24
						30
						30.5
						30.5
						108
						48.5
					123	121
					45.5	45.5
						23
					Sub Total	622
						86.5
						34.5
						32.5
		1.5				69.5
						33
						53.5
2.5	2.5	1.5	1			213.5
2.5	2.5	1.5				36
						18
					Sub Total	587
					Total	1540

Appendix 3
Lithologic Logs

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL

Depth (Ft)	Description	Blows/Ft.
OSW-1		
5 – 7	CL-ML Red silty CLAY	4.4.7.7
10 – 12	ML – Tan/red fine micaceous SILT (saprolitic w/structure)	3.5.5.7
15 – 17	ML – Tan fine micaceous SILT saprolitic/structure	4.5.5.8
20 – 22	ML – Tan fine micaceous SILT with medium sand layers (weathered feldspar)	3.4.4.5
25 – 27	6" PWR green sandy silty PWR (little micaceous) definite structure (gravel size quartz fragments) 1st 6" – ML – tan micaceous SILT	50/6"
30 – 32	PWR – Green/blue contact, blue-GNEISS with white veins	17.30.34.50/5
35 – 37	Same as above, but harder 37' – Rig shaking but 39 – 40 – softer	
40 – 42	ML-Tan, wet micaceous SILT w/layer of hard GNEISS above the silt layer	
	Stop at 43' – Pull --- augers and drill at w/6-1/4"	
OSW-2		
5 – 7	CL-ML Red silty CLAY (micaceous)	3.4.4.6
10 – 12	CL-ML - Layers of red silty CLAY and tan silty CLAY very micaceous – saprolitic – little structure with black manganese	
15 – 17	ML – Red/tan micaceous SILT w/sand and saprolitic/manganese and chunks of quartz – definite structure	5.5.6.5
20 – 22	ML – Tan micaceous SILT with black biotite and one quartz layer (saprolitic)	3.3.5.6
25 – 27	ML – Tan micaceous SILT w/black layers, saprolitic, little moisture	4.5.6.8

Note: Description is taken from field logs provided by Environmental Investigations.
PWR = Partially weathered rock

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
OSW-2	***Continued***	
30 – 32	MLl – Blue/gray and green, saprolitic SILT (micaceous) w/tan layers (much structure) weathered GNEISS	5.17.22.25
35 – 37	Tan micaceous SILT (saprolitic) little bit of blue layer on top – hard but very silty	17.50/4
40 – 42	ML – Tan micaceous SILT w/rock, fragments of GNEISS with feldspar	50/5
42.5 – 43	Bedrock	50/3
	REFUSAL 42.5	
OSW-3		
5 – 7	CL-ML Red/tan silty CLAY w/little sand, micaceous with quartz crystals	4.6.9.11
10 – 12	SM – Tan silty SAND, micaceous w/lots of quartz, saprolitic w/structure SCHIST-like in nature (much sandier than previous borings)	6.10.11.13
15 – 17	ML Tan SILT saprolitic (quartz vein) chunk (micaceous)	5.8.9.12
20 – 22	ML – Tan micaceous SILT saprolitic (powder sand) manganese layered within	5.6.10.10
25 – 27	Same as above, little darker and more structure	5.8.11.13
Split spoon SS-30 – 32	Same as above, rock fragments and moist	4.8.12.12
35 – 37	Same as above	4.7.10.11
40 – 42	Same as above (wetter) (more sand)	7.11.14.16
45 – 47	Same as above (some sand, more rock fragments)	3.8.13.16
50 – 52	Same as above	8.11.27.50/4

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
OSW-4		
4 – 6	CL-ML Red silty CLAY (slightly micaceous) with quartz vein	4.8.9.10
9 – 11	ML – Tan very micaceous SILT w/sand	3.4.5.6
14 – 15	ML – Pink/white/yellow SILT (weathered quartz with quartz fragments)	4.7.8.10
19 – 21	ML – Tan pink white micaceous SILT, feels like sand, too shallow, weathered quartz some manganese veins	3.5.7.8
24 – 26	Same as above with no pink color	4.6.10.10
29 – 31	Same as above (moist saprolite)	4.5.8.8
34 – 36	Same as above – moist	5.6.9.9
39 – 41	ML – Tan/brown micaceous SILT w/manganese veins, wet	2.5.6.9
44 – 46	Same as above, micaceous SILT (saprolite) w/sand but harder, wetter and more structure	6.7.11.17
49 – 51	PWR with Pink feldspathic (K-Spar) granite fragments of white matrix	10.21.25.31
54 – 56	PWR – Same as above with brown layers	7.10.22.35
59 – 61	ML – Tan micaceous SILT saprolite	5.8.11.18
64 – 66	Same as above	8.21.38.43
68 – 70	68' REFUSAL	

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-1A		
5 – 7	CL-ML Red silty micaceous with CLAY, some structure, more than normal at this depth	3.4.6.8
10 – 12	ML – Tan micaceous SILT w/manganese veins and pink feldspar – very saprolitic and friable	2.3.3.3
15 – 17	ML – Same as above, but w/large fragments of smoky quartz and very SCHIST at end of spoon (more saprolitic)	2.4.4.6
20 – 22	ML – Tan, very micaceous SILT w/fine sand, quartz rock fragments and manganese veins	2.4.6.6
25 – 27	ML – Lt. Tan micaceous SILT w/fine sand structure – manganese veins and powdery white layers	3.4.7.8
30 – 32	ML – Tan/brown micaceous SILT with fine sand saprolite w/manganese veins	6.10.11.16
35 – 37	ML – Dark gray very micaceous SILT w/sand PWR-SCHIST with feldspar fragments and manganese veins	11.36.50/4"
40 – 42	Same as above PWR SCHIST	27.50/4"
42 – 44	PWR – with dry SCHIST	
MW-3A		
4 – 6	CL-ML red silty CLAY	3.6.8.8
9 – 11	ML – red/tan SILT w/sand micaceous/mang. Veins (saprolitic)	3.4.4.4
14 – 16	ML tan SILT w/sand mang. Pink veins not as micaceous as other borings (saprolitic)	2.3.4.4
19 – 21	ML – Same as above, but more mica	2.2.3.4
24 – 26	ML – Tan, micaceous SILT w/sand, much structure, large amount of manganese, tighter and layered	3.5.7.8

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-3A	***Continued***	
29 – 31	SCHIST saprolite – more structure; ML-tan layered micaceous SILT w/sand	6.8.12.14
34 – 36	Same as above; big rock fragments (quartz)	3.9.7.10
39 – 41	Saprolite – more structure; ML-tan/brown, white black layered micaceous SILT w/sand	3.10.17.19
44 – 46	ML – Dark brown/tan to light beige SILT w/sand; saprolite with manganese veins	3.18.50/5"
49 – 51	Saprolite – ML-tan/brown layered SILT w/sand (micaceous)	50/6"
54 – 56	Same as above, with gray layers	50/6"
59 – 61	ML – Same as above, very hard bits of GNEISS, blue/gray at tip of spoon	
64 – 66	Same as above ½" – ¾" fragments REFUSAL	50/6
MW-4A		
5 – 7	CL-ML Red silty CLAY, some mica, few quartz fragments	3.4.8.9
10 – 12	ML – Red/tan micaceous SILT w/manganese veins	2.3.3.5
15 – 17	ML – Tan micaceous SILT s/manganese veins and some sand, some remnant structure	2.2.3.5
20 – 22	ML – Tan very micaceous SILT w/manganese veins, wetter and less structure	2.2.2.4
25 – 27	ML – Tan/brown, micaceous SILT w/quartz fragments, saprolite, hard schist-like material	2.3.7.8
30 – 32	ML – Tan brown micaceous SILT w/gneiss fragments and layers – some blue/gray parent rock	4.15.17.25
35 – 37	Same as above – very hard	24.50/5
39 – 41	PWR – Bedrock SCHIST (micaceous) very dark–black	23.50/4

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-5		
5 – 7	ML – Slightly clayey, red/brown SILT (medium micaceous composition)	5.5.9.10
10 – 12	ML – Red/pink/tan clayey micaceous SILT, some structure, w/manganese veins	3.4.5.6
15 – 17	ML – Red/tan, micaceous SILT w/manganese veins, large quartz rock fragments (saprolite)	
20 – 22	ML – Tan micaceous SILT w/manganese veins, dark micaceous silt	5.5.5.7
25 – 27	ML – Tan/pink micaceous SILT with manganese veins and quartz fragments (saprolite)	5.5.6.8
30 – 32	ML – Tan, micaceous SILT w/manganese veins (saprolite)	6.8.11.13
35 – 37	ML – Tan micaceous SILT w/manganese veins, wet, dark matrix and white sandy layer, some quartz fragments	5.8.12.12
40 – 42	40-41 – Tan micaceous SILT w/sand, manganese veins 41-42 – Red brown micaceous SILT manganese veins layered saprolitic – slightly clayey w/green particles	5.10.15.18
45 – 47	ML – Tan micaceous SILT, highly layered, PWR – GNEISS, w/gree/gray gneissic bands white/dark bands – calcite veins	6.12.18.20
50 – 52	PWR – GNEISSIC w/calcite veins (same as above)	12.18.29.32
55 – 57	PWR – GNEISSIC and same as above	12.29.50/5
60 – 62	Same as above w/quartz fragments	50/6
MW-5A		
	SHALLOW WELL – NO SPOONS 28' cuttings, wet	
	40' stop	

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-6		
4 – 6	ML-CL Red silty CLAY w/little sand (micaceous) quartz rock fragment	3.5.6.8
9 – 11	CL-ML Tan silty CLAY w/little sand (micaceous) saprolitic w/manganese	3.4.6.7
14 – 16	ML – Tan micaceous SILT (saprolitic) 1st fist horizon 15 – 16 lighter powdery more structure w/gold mica	3.4.5.6
19 – 21	ML – Tan brown micaceous SILT and saprolitic (dark saprolite interlayered w/tan and red layers) very moist	
24 – 26	ML – Tan micaceous SILT saprolitic (layer of feldspar) not as weathered	5.7.12.12
29 – 31	ML – Tan micaceous SILT with black rock fragments at very bottom	6.9.13.20
34 – 36	ML – Tan micaceous SILT (saprolite) tight and compact (wet)	10.19.20.50/5"
39 – 41	Same as above, some SCHIST rock fragments	39.50/6"
44 – 46	Same as above	16.25.50/6"
49 – 51	Same – but harder with more SCHIST rock fragments	50/4"
54 – 56	Very hard	50/4"
59 – 61	Blue rock at end of spoon catcher	50/3"
MW-7		
5 – 7	CL-ML - Red silty CLAY with some micaceous	2.4.8.11
10 – 12	ML – Red micaceous SILT with manganese veins	3.3.5.5
15 – 17	ML – Red/tan micaceous SILT w/manganese veins and some sand (saprolite – some structure)	3.5.5.5

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-7	*Continued*	
20 – 22	ML – Red/tan micaceous SILT w/manganese veins saprolitic – more structure	2.4.5.5
25 – 27	ML – Tan micaceous SILT w/some sand, white sandy layer at bottom – followed by darker SCHIST saprolite	2.5.8.9
30 – 32	ML – Tan to white micaceous SILT with some sand, (powdery saprolite) with manganese veins	5.9.9.9
35 – 37	ML – Tan, very micaceous, SILT PWR is saprolite manganese/hard and tight	9.28.30.30
37 – 39	Same as above	28/50/4
40 – 42	Same as above but harder PWR schist-like	38/50/6"
45 – 47	45–46 – same as above 46-47 – chunks of quartz ML tan silt w/sand ROCK REFUSAL AT 46'	26.28.50/3"
MW-8		
4 – 6	4-5 CL-ML Tan/red silty micaceous CLAY	4.88.8
9 – 11	ML – Tan micaceous SILT saprolitic (little sand)	4.4.5.7
14 – 16	ML – Tan micaceous SILT (moist 1 – last 5" – gneissic dust) PWR (very hard) REFUSAL AT 16' NO WATER Second Attempt 13' Rock no H_2O No Spoons Rock at 14' – GNEISS	4.26.50/5"
27.5 – 29	Softer gray very micaceous/amphibole dark SCHIST Drilled to 56.0' bs Lost some footage overnight	

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-9		
4 – 6	CL-ML – Tan/red silty CLAY layer of quartz --- fragments	3.9.5.6
9 – 11	ML – Tan micaceous SILT (saprolitic – manganese and blue/green saprolite) very wet	3.4.6.8
14 – 16	ML – Tan micaceous SILT interlayered with PWR GNEISS – much more structure – looks like OSW-1 and OSW-2	50/4
19 – 21	Same as above – bottom of spoon rock fragments (GNEISSIC dust) AUGER REFUSAL AT 19.5'	12.50/3
MW-10		
4 – 6	CL-ML Tan micaceous silty clay (mostly SILT)	1.2.3.4
9 – 11	ML – Tan and black micaceous SILT, manganese – saprolite	3.3.4.6
14 – 16	ML – Tan to red micaceous SILT w/sand saprolitic – manganese vein in remnant fracture	3.3.6.8
19 – 21	Same as above	3.3.13
24 – 26	ML – Tan micaceous SILT w/ sand – saprolite not as much mica	3.7.9.12
29 – 31	ML – Red SILT w/rock fragments, saprolitic (GNEISS fragments) chunky quartz	4.10.18
34 – 36	No spoon	
39 – 41	ML – Tan SILT – saprolitic	16.18
44 – 46	Same, but – of dark GNEISSIC saprolite	9.50/4"
49 – 51	No spoon	
55 – 56	Same as 44 – 46', very tight	50/6"
64 – 66	No spoon	

WELL CONSTRUCTION DATA
WARREN COUNTY PCB LANDFILL
(Continued)

Depth (Ft)	Description	Blows/Ft.
MW-10	***Continued***	
69 – 71	ML – Tan SILT (saprolite with rock fragments)	12.50/3”
74 – 74.5	PWR – Big chunks of red weathered rocks	50/5”
76 – 78	Bedrock green chlorite SCHIST	50/3
MW-10S		
	NO SPOONS – SHALLOW WELL BORING TERMINATED AT 19’BGS	
MW-11		
30 – 32	No Recovery	
	Set at 40’ – Shallow Well	
	Additional Spoon – 40 – 42	4.8.12.14
MW-12		
30 – 32	SM – Tan micaceous silty SAND	7.12.21.25
35 – 37	Very hard rig barely moving	
	Set at 36’	

Appendix 4
Slug Test Results

Geo-Solutions, Inc.
2903 Anderson Drive
Raleigh, NC 27608
(919) 783-0345

April 21, 1997

Mr. David C. Brewster
Environmental Investigations, Inc.
2327 Englert Drive; Suite 1
Durham, NC 27713

RE: Warren County PCB Landfill
Aquifer Testing Results

Dear Dave:

The purpose of this correspondence is to present the results of the aquifer testing conducted on ten groundwater monitoring wells at the Warren County PCB Landfill in Warren County, North Carolina. The aquifer testing was performed on April 15 and 16, 1997, and consisted of rising and falling head tests (slug tests) on monitoring wells MW-3A, MW-4A, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10S, MW-10D, and MW-12. The purpose of the testing was to assess the values of horizontal hydraulic conductivity (K) at various locations within the water table aquifer at the site.

FIELD WORK SUMMARY:

Field work began on April 15, 1997. Upon arrival, all on-site monitoring wells were opened. Water levels were measured approximately 10 minutes after the caps had been removed to allow pressures to stabilize. Water levels were measured from a datum point marked on the top of the stainless steel well casing.

A 5.5-foot long stainless steel slug was used to displace water inside the wells. A Teflon coated stainless steel leader wire was used to attach the slug to nylon rope in order to prevent the nylon rope from being introduced into the wells. A 20 pounds per square inch (psi) stainless steel pressure transducer equipped with Teflon cable was used to measure water level fluctuations during each test.

The stainless steel slug, water level indicator, and the pressure transducer were decontaminated before use in each well and prior to leaving the site. The decontamination procedure consisted of a de-ionized water rinse followed by an Alconox wash, another de-ionized water rinse, a pesticide grade isopropanol rinse, a de-ionized water rinse, and a final rinse with organic-free purified water.

An electronic data logger (In-Situ SE1000C) was used to record the water levels during the testing. Frequent checks of the electronic data were performed by verifying the readings with a water level probe (Solinst 101-B).

The first portion of the test was a falling head test that measured the rate water levels fell back to static after the injection of the decontaminated stainless steel slug. Water level data from the transducer was recorded at logarithmic time intervals by the data logger. The falling head test was terminated after water levels had recovered to within 95% of their pre-test level.

A rising head test was performed on each well after the falling head test was completed. The rising head test was conducted by initiating a new logarithmic recording step on the data logger simultaneously with the removal of the slug. The data was checked with hand held readings, and the test was terminated after water levels had recovered to within 95% of the pre-test level.

DISCUSSION:

The slug test data was analyzed using the Bouwer and Rice and Hvorslev methods. The Bouwer and Rice method accounts for partial penetration effects and changing aquifer thickness (water table conditions). An aquifer thickness of 50 feet was assumed for the water table aquifer, except for MW-10D, where an aquifer thickness of 75 feet was assumed. A packing porosity of 25 percent for the well filter pack was assumed.

The results of the slug test data analyses are summarized on the following tables:

I hope this report is satisfactory and useful. If I may be of any further assistance, please contact me at any time.

Very Truly Yours,

GEO-SOLUTIONS, INC.

Richard E. Bolich, P.G.
President

reb/REB

enclosures: Slug Test Data Analyses Plates
Diskette Containing ASCII Data Files

Table 1

Warren County PCB Landfill Aquifer Slug Testing Results Summary

Bouwer and Rice Method - Falling Head Tests

Well Number	K (centimeters/second)
MW-3A	2.02×10^{-4}
MW-4A	3.90×10^{-4}
MW-5	2.19×10^{-4}
MW-6	2.75×10^{-4}
MW-7	3.14×10^{-4}
MW-8	2.29×10^{-5}
MW-9	6.19×10^{-4}
MW-10S	3.17×10^{-4}
MW-10D	2.48×10^{-3}
MW-12	1.57×10^{-4}

Table 2

Warren County PCB Landfill Aquifer Slug Testing Results Summary

Bouwer and Rice Method - Rising Head Tests

Well Number	K (centimeters/second)
MW-3A	1.82×10^{-4}
MW-4A	3.38×10^{-4}
MW-5	2.64×10^{-4}
MW-6	3.27×10^{-4}
MW-7	3.62×10^{-4}
MW-8	3.97×10^{-5}
MW-9	5.64×10^{-4}
MW-10S	3.43×10^{-4}
MW-10D	2.65×10^{-3}
MW-12	2.23×10^{-4}

Table 3

Warren County PCB Landfill Aquifer Slug Testing Results Summary

Hvorslev Method - Falling Head Tests

Well Number	K (centimeters/second)
MW-3A	3.47×10^{-3}
MW-4A	7.97×10^{-3}
MW-5	4.27×10^{-3}
MW-6	5.19×10^{-3}
MW-7	9.68×10^{-3}
MW-8	6.42×10^{-4}
MW-9	2.82×10^{-2}
MW-10S	1.05×10^{-2}
MW-10D	4.53×10^{-2}
MW-12	3.53×10^{-3}

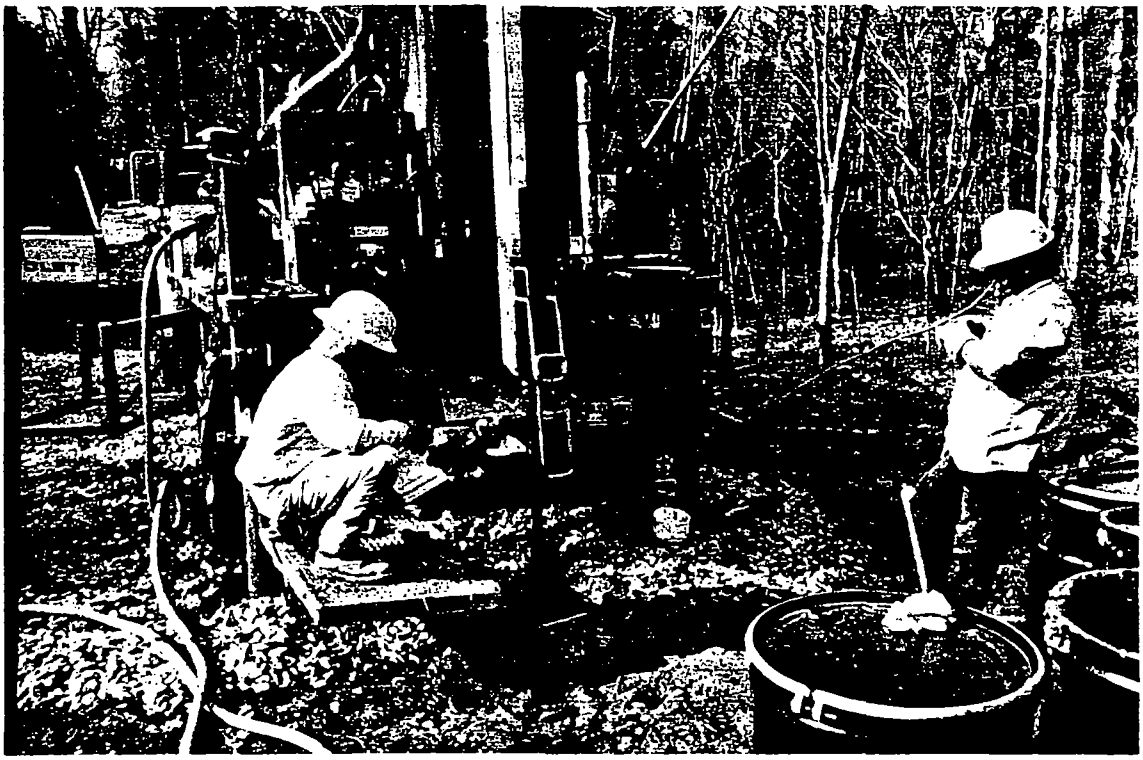
Table 4

Warren County PCB Landfill Aquifer Slug Testing Results Summary

Hvorslev Method - Rising Head Tests

Well Number	K (centimeters/second)
MW-3A	3.09×10^{-3}
MW-4A	7.22×10^{-3}
MW-5	5.02×10^{-3}
MW-6	5.53×10^{-3}
MW-7	9.96×10^{-3}
MW-8	3.15×10^{-3}
MW-9	6.29×10^{-2}
MW-10S	1.19×10^{-2}
MW-10D	3.42×10^{-2}
MW-12	5.03×10^{-3}

Appendix 5
Pictures of Recent Investigative Activities



1.

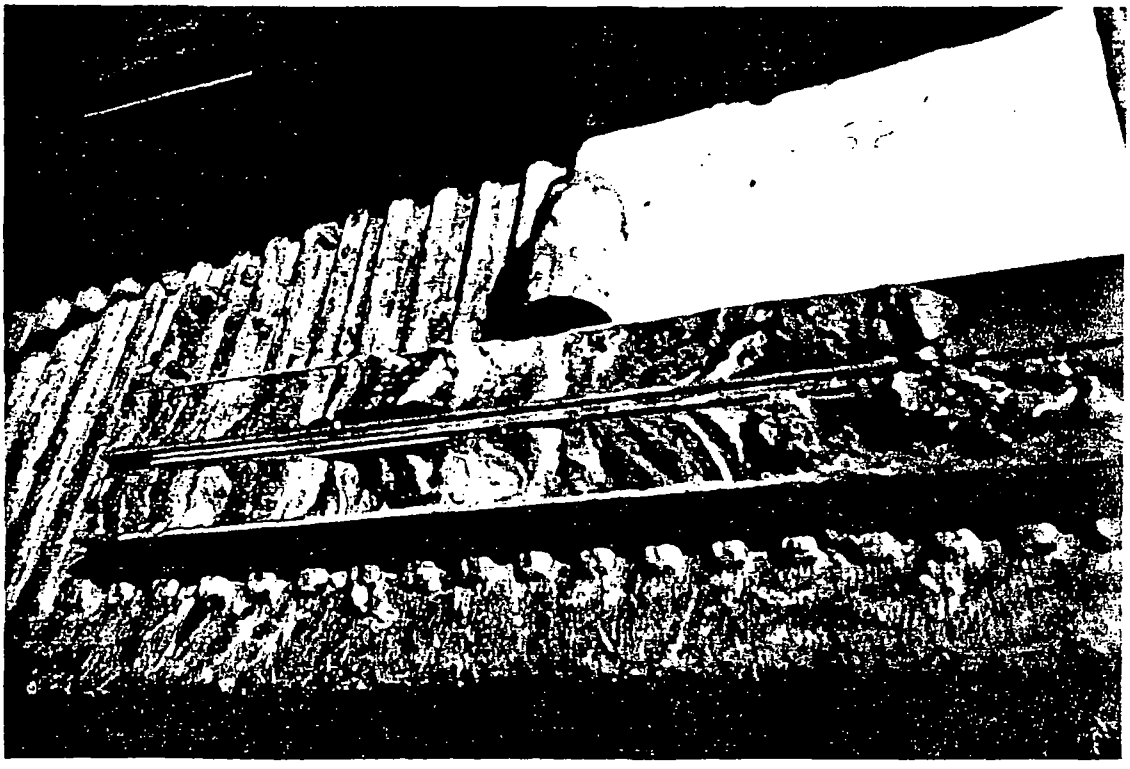
TYPICAL SAMPLING ACTIVITIES
AND MONITORING WELL DRILLING

2.

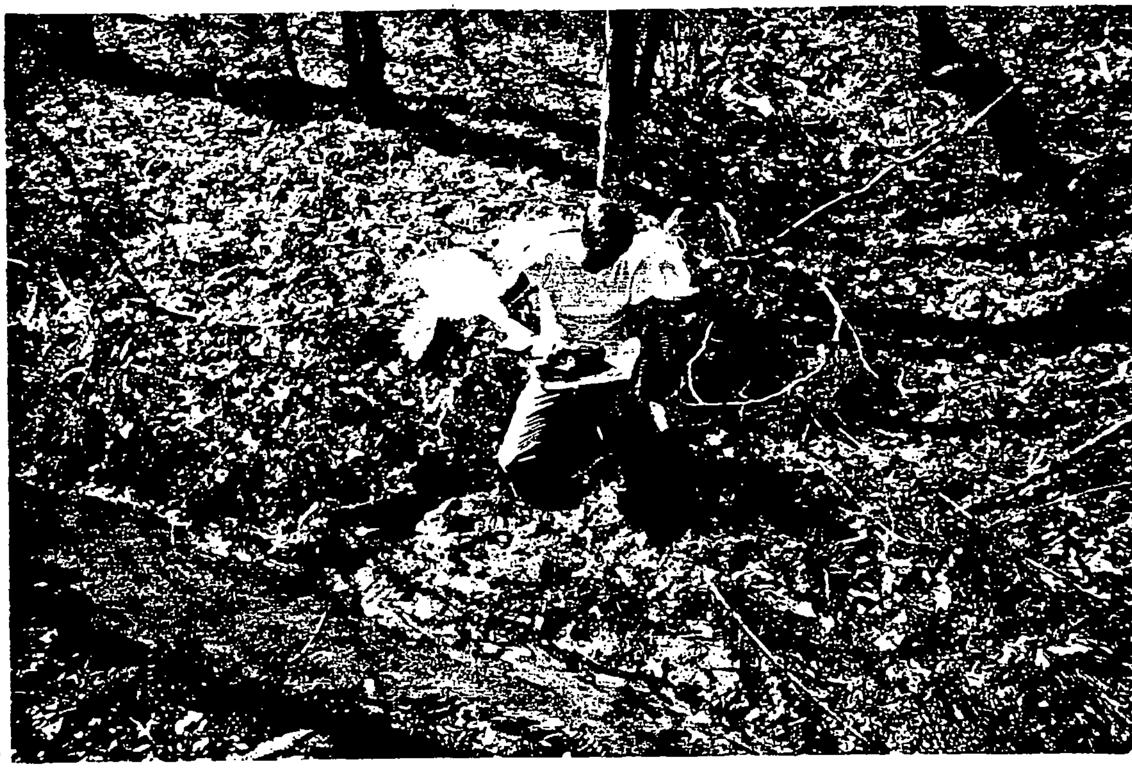
SOIL CORE SAMPLE
SHOWS VERTICAL
MICRO FRACTURES

4.

TYPICAL
WEATHERED
ROCK STRATA
SHOWN



3.

5. 

TYPICAL SEDIMENT AND SURFACE WATER SAMPLING ACTIVITIES

6. 

7.

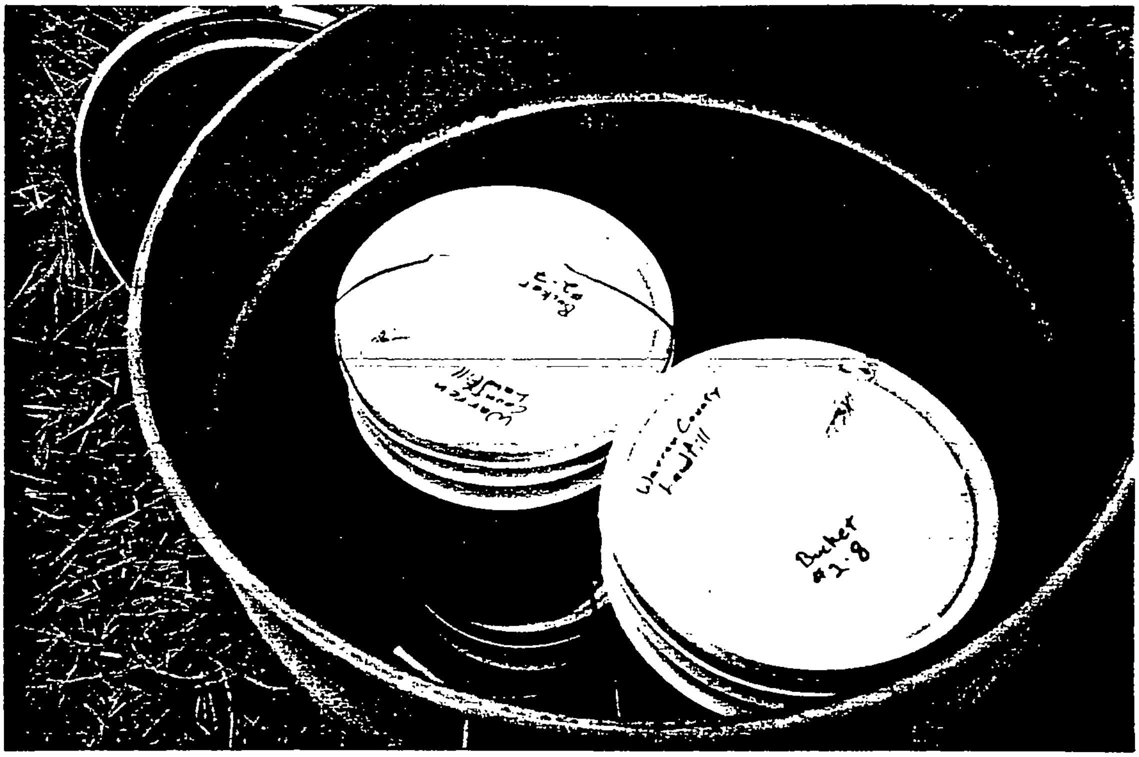
QA/QC BLANK OF SOIL SAMPLING PROCEDURE;
DECONTAMINATION OF SUBMERSIBLE PUMP EQUIPMENT

8.

9. 

DECONTAMINATED WELL CASING, CEMENT GROUT AND FILTER SAND STORAGE

10. 



11.

LANDFILL SOIL REMOVED FROM THE NORTH AND SOUTH BORINGS WERE PLACED IN SEALED 5 GALLON BUCKETS WHICH WERE IN TURN PLACED IN OVERSIZED SOLID WASTE DRUMS


12.

SAMPLE CUSTODY SEALS WERE PLACED ON BY THE SCIENCE ADVISOR PRIOR TO PACKING FOR SHIPMENT

13.

14.

Appendix 6
Air Monitoring Analysis

Southern Testing & Research Laboratories, Inc.

3809 Airport Drive (919) 237-4175 • Fax: (919) 237-9341 Wilson, NC 27896

April 9, 1997

Mr. Pierre Lauffer
North Carolina DEHNR
P.O. Box 27687
Raleigh, NC 27611

Dear Mr. Lauffer:

Attached are the results for the analysis of 25 organic versatile sampler (OVS) tubes for Arochlors 1242, 1254, and 1260. We received 25 samples from you on February 21, 1997 and 6 samples on February 25, 1997. The samples were analyzed using NIOSH Method No. 5503 with a few modifications.

The first modification was the separate analysis of the filter and the front sorbent sections. This was done at your request to allow differentiation of the particulate and vapor phases. We also made a series of modifications for the purpose of improving the detection limits of the method. They include: the use of capillary chromatography for separation (Alltech SE 54, 30 m x 0.32 mm x 0.25 μm), and concentration of the extracts from 2 mL to 100 μL. We also added dibutyl chlorendate as an internal standard to normalize the concentration step.

For quantitation of the chromatograms, we chose eight major peaks for each of the three arochlors. The sample results are listed in Tables 1 and 2. In Table 1, we have listed the results as total ng found and in Table 2, as air concentrations based on the volumes you provided. We only detected arochlors in one sample, W-13017 (STRL No. 6618F2). The amount shown for the sorbent includes both the front and back sections, even though they were analyzed separately. The back section contained 845 ng of Arochlor 1242, 82.7 ng of Arochlor 1254, and Arochlor 7.3 ng 1260. It is apparent that there was significant breakthrough of some of the 1242 components for this sample.

Our limit of quantitation is about 1 ng for Arochlors 1254 and 1260, and 5 ng for Arochlor 1242. These were verified by successful recovery of laboratory spikes at these levels.

We appreciate the opportuinity to work with you on this project. Call me if you have any questions.

Sincerely,

Kim W. Baughman
Kim W. Baughman,
Technical Director

Table 2. Results as Air Concentrations

DENHR I.D.	STRL I.D.	Arochlor 1242 (ng/m³)		Arochlor 1254 (ng/m³)		Arochlor 1260 (ng/m³)	
		Filter	Sorbent	Filter	Sorbent	Filter	Sorbent
W-13017	6618F2	2.5	2090	2.5	588	2.2	567
W-15400	6618F3	< 3.6	< 3.6	< 0.8	< 0.8	< 0.8	< 0.8
W-15277	6618F4	< 5.3	< 5.3	< 1.1	< 1.1	< 1.1	< 1.1
W-15395	6618F5	< 5.4	< 5.4	< 1.1	< 1.1	< 1.1	< 1.1
W-13013	6618F6	< 3.9	< 3.9	< 0.8	< 0.8	< 0.8	< 0.8
W-15142	6618F7	< 4.5	< 4.5	< 0.9	< 0.9	< 0.9	< 0.9
W-15396	6618F9	< 3.2	< 3.2	< 0.7	< 0.7	< 0.7	< 0.7
W-11706	6618F11	< 5.4	< 5.4	< 1.1	< 1.1	< 1.1	< 1.1
15398	6692F1	< 3.8	< 3.8	< 0.8	< 0.8	< 0.8	< 0.8

Note: Concentrations are calculated based on air volumes supplied by DENHR.

SAMPLING POINTS AT PCB LANDFILL

Sampling Time of February 10-18

W-15396	Background
W-15400	Vent
W-15142	Back Fence (south side on fence from vent - 35 feet east off center)
W-13013	Fore Fence (south side on fence from vent - 35 feet west off center)
W-15398	Seep Area on West - Northwest side of landfill
W-11706	Downwind (200 yards south of outer fence of landfill)
W-15277	Right 2 meters - 2 miles downwind to the southeast of vent
W-13017	Left 2 meters - 2 miles downwind to the southwest of vent

Sampling Time of February 18-24

W-15142-per	This is a sample from one of the contractors. He wore it while drilling on landfill
Fence south	Straight downwind from drill on the fence
Cone south	35 feet south of work area on landfill at a cone
Center vent	
Vent	
116' from fence	
Fence	

Sampling of the 2 work areas where plastic was removed

15398	Southeast - 30' from cut out area - the south cut area
13017	Southwest - 30' from cut out area
15394	South Central - 30' from cut out area
15401	Northeast - 30' from the north cut out area
13013	Northwest
15400	North Central

ATTACHMENT #1

Southern Testing & Research Laboratories, Inc.

3809 Airport Drive (919) 237-4175 • Fax: (919) 237-9341 Wilson, NC 27896

April 9, 1997

Mr. Pierre Lauffer
North Carolina DEHNR
P.O. Box 27687
Raleigh, NC 27611

Dear Mr. Lauffer:

Attached are the results for the analysis of 25 organic versatile sampler (OVS) tubes for Arochlors 1242, 1254, and 1260. We received 25 samples from you on February 21, 1997 and 6 samples on February 25, 1997. The samples were analyzed using NIOSH Method No. 5503 with a few modifications.

The first modification was the separate analysis of the filter and the front sorbent sections. This was done at your request to allow differentiation of the particulate and vapor phases. We also made a series of modifications for the purpose of improving the detection limits of the method. They include: the use of capillary chromatography for separation (Alltech SE 54, 30 m x 0.32 mm x 0.25 μm), and concentration of the extracts from 2 mL to 100 μL. We also added dibutyl chlorendate as an internal standard to normalize the concentration step.

For quantitation of the chromatograms, we chose eight major peaks for each of the three arochlors. The sample results are listed in Tables 1 and 2. In Table 1, we have listed the results as total ng found and in Table 2, as air concentrations based on the volumes you provided. We only detected arochlors in one sample. W-13017 (STRL No. 6618F2). The amount shown for the sorbent includes both the front and back sections, even though they were analyzed separately. The back section contained 845 ng of Arochlor 1242, 82.7 ng of Arochlor 1254, and Arochlor 7.3 ng 1260. It is apparent that there was significant breakthrough of some of the 1242 components for this sample.

Our limit of quantitation is about 1 ng for Arochlors 1254 and 1260, and 5 ng for Arochlor 1242. These were verified by successful recovery of laboratory spikes at these levels.

We appreciate the opportuinity to work with you on this project. Call me if you have any questions.

Sincerely,

Kim W. Baughman
Technical Director

Table 1. Sample Results as Total Nanograms

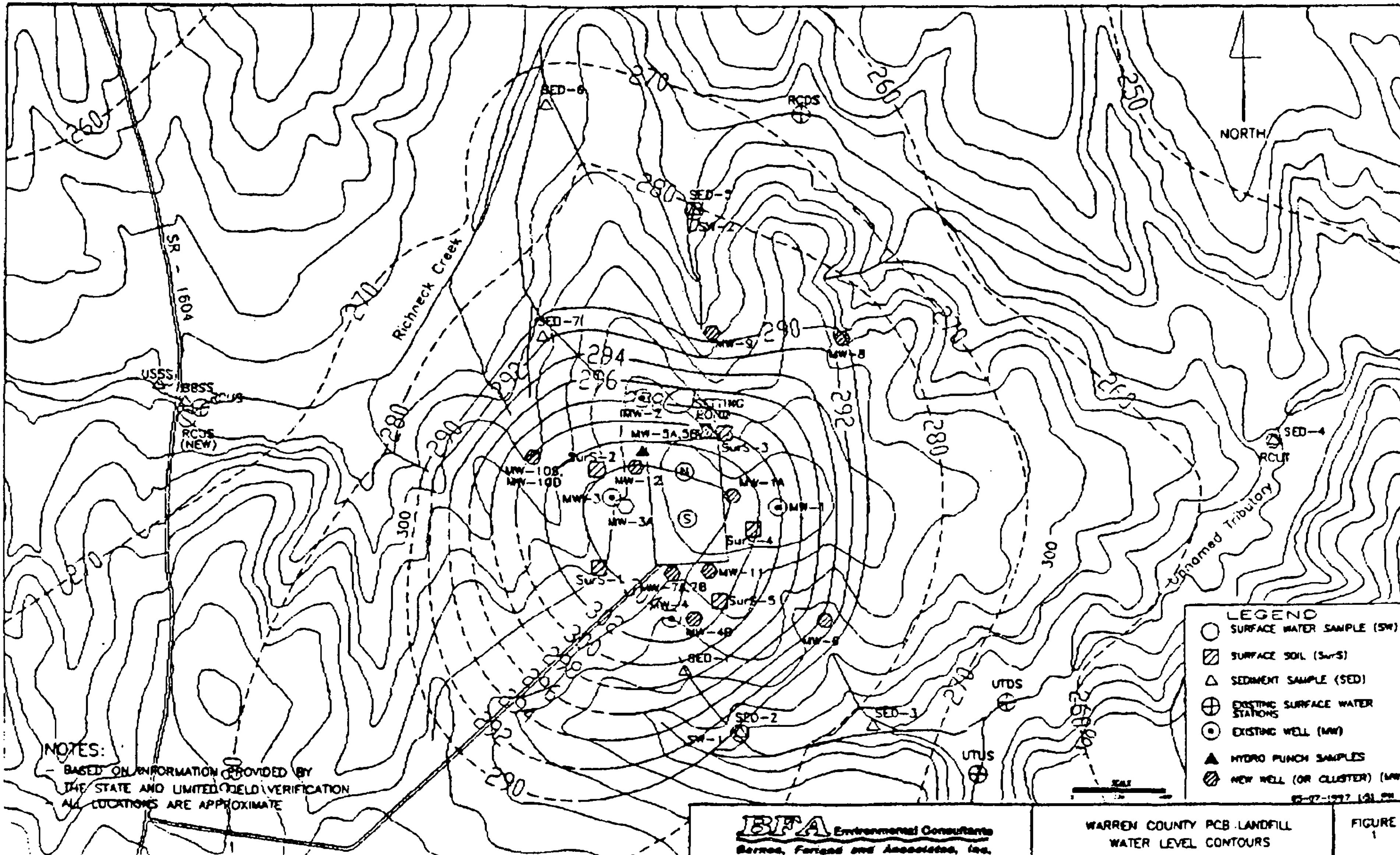
DENHR I.D.	STRL I.D.	Arochlor 1242 (ng)		Arochlor 1254 (ng)		Arochlor 1260 (ng)	
		Filter	Sorbent	Filter	Sorbent	Filter	Sorbent
W-13011	6618F1	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-13017	6618F2	3.2	2,630	3.1	738	2.8	712
W-15400	6618F3	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-15277	6618F4	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-15395	6618F5	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-13013	6618F6	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-15142	6618F7	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-15142-per	6618F8	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-15396	6618F9	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-15398	6618F10	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
W-11706	6618F11	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Lab Blank	6618F12	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Field Blank	6618F13	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Fence South	6618F14	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Cone South	6618F15	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Center Vent	6618F16	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Vent	6618F17	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
116' from Fence	6618F18	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
Fence	6618F19	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
15398	6692F1	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
13017	6692F2	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
15394	6692F3	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
15401	6692F4	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
13013	6692F5	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0
15400	6692F6	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0

Table 2. Results as Air Concentrations

DENHR I.D.	STRL I.D.	Arochlor 1242 (ng/m^3)		Arochlor 1254 (ng/m^3)		Arochlor 1260 (ng/m^3)	
		Filter	Sorbent	Filter	Sorbent	Filter	Sorbent
W-13017	6618F2	2.5	2090	2.5	588	2.2	567
W-15400	6618F3	< 3.6	< 3.6	< 0.8	< 0.8	< 0.8	< 0.8
W-15277	6618F4	< 5.3	< 5.3	< 1.1	< 1.1	< 1.1	< 1.1
W-15395	6618F5	< 5.4	< 5.4	< 1.1	< 1.1	< 1.1	< 1.1
W-13013	6618F6	< 3.9	< 3.9	< 0.8	< 0.8	< 0.8	< 0.8
W-15142	6618F7	< 4.5	< 4.5	< 0.9	< 0.9	< 0.9	< 0.9
W-15396	6618F9	< 3.2	< 3.2	< 0.7	< 0.7	< 0.7	< 0.7
W-11706	6618F11	< 5.4	< 5.4	< 1.1	< 1.1	< 1.1	< 1.1
15398	6692F1	< 3.8	< 3.8	< 0.8	< 0.8	< 0.8	< 0.8

Note: Concentrations are calculated based on air volumes supplied by DENHR.

ATTACHMENT # 2



TOTAL SAMPLING TIME AND SAMPLING POINTS AT WARREN COUNTY PCB LANDFILL

Sampling period for- 3/10-13/97

Sampling Units:		Lab No.	Total Volume (liters):	Placement:
PUF-1	-	011234	180,165 liters	located center line on fence southside of landfill
PUF-2	-	011233	183,852 liters	located on top of landfill next to 2nd sprinkler south of vent
PUF-3	-	011237	153,240 liters	located on fence southside of landfill 70' east of PUF-2

Post-it® Fax Note 7671	Date 5/30	# of pages ▶ 1
To Patrick Barnes	From Mike Kelly	
Co./Dept.	Co.	
Phone #	Phone # 919-733-4996	
Fax # 407-896-1822	Fax #	

END

QUALITY SERVICE AT A FAIR PRICE

Southern Testing & Research Laboratories, Inc.

3809 Airport Drive (919) 237-4175 • Fax: (919) 237-9341 Wilson, NC 27896

May 30, 1997

Mr. Pierre Lauffer
North Carolina DEHNR
P.O. Box 27687
Raleigh, NC 27611

Dear Mr. Lauffer:

Attached are the results for the analysis of 3 modified high volume samplers for Arochlors 1242, 1254, and 1260. We received the samples on March 18, 1997 and analyzed them by EPA Method TO4A.

For quantitation of the chromatograms, we chose several characteristic peaks for each of the three arochlors. The sample results are listed in Tables 1 and 2. In Table 1, we have listed the results as total ng found and in Table 2, as air concentrations based on the volumes you provided. We did not detect arochlors in any of the samples. Our limit of quantitation is about 5 ng for Arochlors 1254 and 1260, and 25 ng for Arochlor 1242.

We appreciate the opportunity to work with you on this project. Call me if you have any questions.

Sincerely,

Kim W. Baughman
Technical Director

Southern Testing & Research Laboratories, Inc.

3809 Airport Drive (919) 237-4175 • Fax: (919) 237-9341 Wilson, NC 27896

FAX TRANSMITTAL

Date May 30, 1997

The following pages are for:

Name Pierre Lauffer

Location NC DEHNR

Fax No 919-715-3605

From Kim Baughman

Total Number of Pages Sent (Including Cover Sheet) 3

To: Joel Hirschhorn
Patrick Barnes
Jim Warren

FYI / here is the latest Results.

Mike Kelly

Table 1. Sample Results as Total Nanograms

DENHR I.D.	STRL I.D.	Arochlor 1242 (ng)		Arochlor 1254 (ng)		Arochlor 1260 (ng)	
		Filter	PUF	Filter	PUF	Filter	PUF
PUF-1	7243F1	< 25	< 25	< 5	< 5	< 5	< 5
PUF-2	7243F2	< 25	< 25	< 5	< 5	< 5	< 5
PUF-3	6692F6	< 25	< 25	< 5	< 5	< 5	< 5

Table 2. Results as Air Concentrations

DENHR I.D.	STRL I.D.	Arochlor 1242 (ng/m^3)		Arochlor 1254 (ng/m^3)		Arochlor 1260 (ng/m^3)	
		Filter	PUF	Filter	PUF	Filter	PUF
PUF-1	7243F2	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05	< 0.05
PUF-2	7243F3	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05	< 0.05
PUF-3	7243F4	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05	< 0.05

Note: Concentrations are calculated based on air volumes supplied by DENHR.

END

TOTAL SAMPLING TIME AND SAMPLING POINTS AT WARREN COUNTY PCB LANDFILL

Sampling of February 10-18

Samples:	Total sampling time:	Sampling point:
w-11706	1823 minutes	downwind (200 yards south of landfill fence)
w-13013	1766 minutes	fore fence (south fence 35 feet west off center)
w-13017	1916 minutes	Left 2 meters downwind to the southeast of vent
w-15395	1788 minutes	leach box
w-15396	2045 minutes	background
w-15398	1829 minutes	seep area west-northwest side of landfill
w-15400	2007 minutes	vent
w-15142	1958 minutes	back fence (south fence 35 feet east off center)
w-15277	1974 minutes	right 2 meters downwind to the southwest of vent

Sampling of February 18-24

w-15142-per	74.2 minutes	This is a sample from one of the contractors while drilling on landfill
fence south	408 minutes	straight donwind on fence from drill area
cone south	409 minutes	35 feet south of work area on landfill at cone
center vent	417 minutes	
south vent	394 minutes	
116'from fence	418 minutes	
fence	420 minutes	123 south of perimeter

Sampling of the 2 work areas where plastic was removed:

15398	323 minutes	southeast- 30' from cut out area- south cut area
13017	323 minutes	southwest-30' from cut out area- south cut area
15394	323 minutes	south central- " " " " " " "
15401	236 minutes	northeast- 30' from the north cut out area
13013	236 minutes	northwest- 30' from the north cut out area
15400	236 minutes	northcentral " " " " " " "

State of North Carolina
Department of Environment, Health and Natural Resources
Division of Solid Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

DEHNR

POST SAMPLING REPORT OF ACTUAL ACTIVITIES FOR:

MEASUREMENT OF FUGITIVE ATMOSPHERIC EMISSIONS OF PCBS FROM THE PCB LANDFILL WARREN COUNTY, NORTH CAROLINA

Dates covered: February 10-17, 1997

Participants:
Pierre Lauffer, HWS- Health and Safety Coordinator
Sandra Moore, HWS- Environmental Chemist
Doug Roberts- HWS- Hydrogeologist
John Kirby, HWS- Environmental Chemist
Johnny Ford, HWS- Environmental Technician

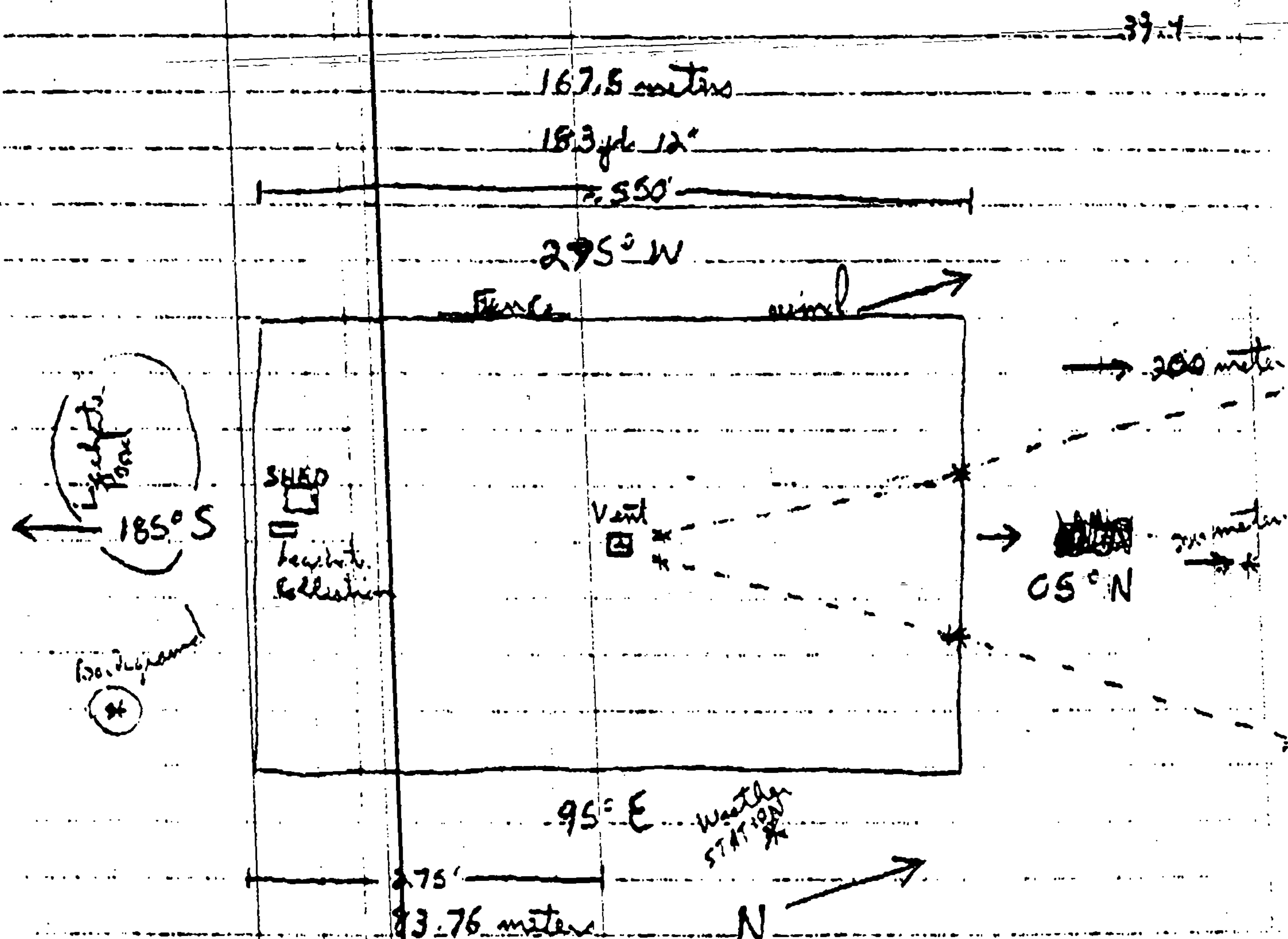
As per the sampling plan, the materials and methods for the air sampling remained the same except for the sampling schedule and the amount of sampling per sampling point. The original schedule as described in the sampling plan was modified due to the weather conditions and the low air-flow rates per pump. Also due to the high total volumes of air required per unit for this study and low air-flow rates for the air-flow pumps, we were required to employ the same glass fiber filter/florisil tube system per sampling point for the whole sampling period of February 10-17, 1997. Each sampling unit included a filter head canister containing a glass fiber filter and florisil tube as described in the sampling plan. During the sampling period February 10-17, the mainfolded sampling units/numbers used and their corresponding total air volume were:

w-15396- 1574 liters	w-15400- 1419.4 liters	w-15142- 1113.5 liters
w-13013- 1291.5 liters	w-15398- 1324 liters	w-11706- 924.23 liters
w-15395- 933.7 liters	w-13017- 1256 liters	w-15277- 957 liters

One may see that the wanted 1500 total liters was not attained for most. Several though may have reached that limit if sampling continued for the rest of the day. Dr. Joel Hirschhorn decided to hault that portion of the sampling on February 17 in order to continue the rest of the landfill project. We then switched the original tubes and filters and began a new round of sampling.

We never switched the tubes or glass-fiber filters during this sampling period. Chain-of-custody was assigned to each sample upon leaving our possession and entering into the laboratory's custody.

PCB Landfill - Warren Co. 12/13/96



Each filter will be ±1 meter off of ground

275
2
350

Appendix 7
Liner Evaluation Report/Landfill Water Recovery Well

LANDFILL CAP EVALUATION
WARREN COUNTY PCB LANDFILL
WARREN COUNTY, NORTH CAROLINA
S&ME PROJECT NO. 1054-97-670

Prepared For:

NCDEHNR
Division of Waste Management
Solid Waste Section
P.O. Box 27687
Raleigh, North Carolina 27611-7687

Prepared By:

S&ME, Inc.
P.O. Box 7668
Charlotte, North Carolina 28241-7668

June 5, 1997

S&ME

June 5, 1997

North Carolina Department of Environment, Health, and Natural Resources
Division of Waste Management
Solid Waste Section
P.O. Box 27687
Raleigh, North Carolina 27611-7687

Attention: Mr. Ed Mussler, P.E.
Solid Waste Section

Reference: **Landfill Cap Evaluation**
Warren County PCB Landfill
Warren County, North Carolina
S&ME Project No. 1054-97-670

Division Staff:

S&ME, Inc. has completed an evaluation of the landfill cap for the Warren County PCB Landfill in Warren County, North Carolina. The evaluation was performed in general accordance with our Work Plan for Excavation, Handling, and Storage of PCB Contaminated Soils, dated February 13, 1997. This report includes project information, our field evaluation, laboratory testing, conclusions and qualifications of report.

PROJECT INFORMATION

The Warren County PCB Landfill occupies 2.5-acres of a 19.3-acre site located on the east side of SR 1604, approximately two miles east of the intersection of SR 1604 and US 401 South, approximately two to three miles south of Warrenton, North Carolina. Design and construction of the PCB landfill occurred in the early 1980's as the result of a joint agreement between the State of North Carolina and the US Environmental Protection Agency. The PCB landfill is owned and maintained by the State.

S&ME, Inc. 9751 Southern Pine Boulevard, Charlotte, North Carolina 28273, (704) 523-4726, Fax (704) 525-3953
Mailing address: P.O. Box 7668, Charlotte, North Carolina 28241-7668

We understand that the intent of the landfill cap was to minimize precipitation into the landfill and minimize the potential for PCB's releasing to the environment. Original specifications of the landfill cap were not available, except as provided on the as-built drawings.

S&ME's landfill cap evaluation was completed as part of the drilling of two soil borings for bulk sampling (of landfilled PCB soils) and installation of recovery wells. Accordingly, our cap evaluation was limited to two locations in the landfill.

FIELD EVALUATION

An S&ME professional engineer and engineering technician, both experienced in landfill closures, evaluated the landfill cap at two sampling locations on February 28, 1997.

According to the as-built drawings, the landfill cap consists of two feet of cover material and a 10-mil thick Polyvinyl Chloride (PVC) liner underlain by two feet of compacted clay liner and one foot of bridging material as shown on Figure 1. The objective of the field evaluation was to evaluate the soil cover, PVC liner and clay liner. This evaluation was completed with a combination of field observations, procurement of relatively undisturbed samples and laboratory testing. The following sections describe the field activities and observations.

Soil Cover and Clay Liner

The investigation began during advancement of a borehole at the two sample locations (designated as B-1 and B-2) as shown on Figure 2. During this phase, two relatively undisturbed soil samples were obtained from the protective cover at each sample location. The samples were obtained by pushing thin-walled Shelby tubes from the ground surface to a depth of approximately two feet. The cover soils were determined to be approximately 22 inches thick at each sample location and visually field classified as a silty clay. A good stand of grass was noted above the cover soil.

each sample location and visually field classified as a silty clay. A good stand of grass was noted above the cover soil.

Based on field measurements and visual observations, the cover soil type and thickness varied from the as-built construction drawings which indicate a one-foot thick topsoil layer above a one-foot thick cover soil layer.

An approximately 16-inch diameter hole was made at both sample locations where the two cover soil samples were obtained. The excavation extended to the PVC liner. The PVC liner within the excavation was cut and properly disposed. Three undisturbed samples were obtained from the underlying clay liner at a depth of approximately two to four feet (zero to approximately two feet below the PVC liner) within each area of the excavation. The clay liner samples were field classified as silty clay. The surface of the clay liner was relatively smooth with a few dozer tracks that likely resulted during final compaction of the clay liner. The surface of the clay liner did not show signs of desiccation or softening and appeared to be in good condition based on our experience with landfill clay liner construction. The clay liner samples were measured to be two feet thick which conformed with the as-built construction drawings. The as-built construction drawings also indicate a one-foot thick layer of "bridging" material exists beneath the two-foot thick clay liner layer.

PVC Liner

To evaluate the PVC liner, an excavation was made adjacent to each borehole location. This excavation was approximately five feet-six inches by five feet-six inches in plan dimensions and extended vertically to the top of the PVC liner.

At sample location B-2, the first two to four inches of cover soil directly above the PVC liner was excavated using a large stainless steel spoon. This was done to limit contact with the PVC liner and thus avoid damage. At this sample location, the PVC liner had adhered to a set of dozer tracks within the underlying clay. An approximately five foot by four foot section of the PVC liner was cut from the bottom of the excavation. This sample cut was positioned to split the set of dozer tracks to allow a smooth repair. The cut PVC sample was washed with detergent and potable water and cleaned at the on-site decontamination area to remove adhered soil prior to transporting to our laboratory for testing.

The cover soil at sample location B-1 was excavated with a plastic shovel that was used to wedge the soil cover from the excavation area. The shovel came in contact with the PVC liner at several places possibly forming pinholes in the liner. The PVC liner at Sample location B-1 also had two small tears. One tear was attributed to the excavation of the cover soils. The second tear measured approximately one inch by a half-inch and had evidence of vegetative root penetration. An approximately five foot by five foot section of PVC liner was cut, washed and cleaned similarly at sample location B-2.

The initial visual evaluation of the liner samples indicated that vegetative roots were penetrating the PVC liner seams at both locations. Following cleaning of both samples, each was held to the sunlight to inspect for pinholes. Approximately 20 pinholes were observed in Sample B-1 and no pinholes were observed in Sample B-2. As noted above, some of the pinholes in Sample B-1 may have been formed during excavation of the cover soils.

were samples also subjected to a light table?

PVC liner Sample B-1 was delivered to S&ME's subsidiary, Singleton Labs, Inc., located in Knoxville, Tennessee, for physical property testing. Liner Sample B-2 was delivered to our Charlotte, North Carolina office for seam testing. These tests are discussed on page seven of this report.

The two PVC liner sample openings were patched by Plastic Fusion Fabricators, Inc., of Huntsville, Alabama, immediately after the cuts were made. The patching was observed by an S&ME senior engineering technician experienced in plastic liner repair. At each patch, the existing PVC liner edge was cleaned with detergent and potable water then dried. Variations were made in the original work plan by not placing geosynthetic clay liner (GCL) on top of the exposed clay. We concluded that to do so in such a confined space could strain the PVC liner seam.

Pieces of new 20-mil PVC liner were sized to overlay the sample cuts. The PVC liner overlap was approximately three inches for sample location B-1 and two and one-half inches for sample location B-2. Two patches were required for B-2 due to the existing PVC seam being so close to the excavation edge. The patches were glued to the existing PVC liner using a paintbrush to apply PVC glue. Pressure was applied to the liner seam to form a chemical bond. The integrity of the glued seam was tested by the blunt-end pick test in accordance with *USEPA Technical Guidance Document EPA/530/SE-91/051, Inspection Techniques for the Fabrication of Geomembrane Field Seams, Section 9.5*. Observations concluded that the patched seams bonded adequately and passed the EPA test method.

Before backfilling the sample locations, a filter fabric was placed within the excavations directly above the PVC liner to help reduce potential damage to the patches during backfilling. The adjacent stockpiled cover soils were used to backfill the excavations. The replaced soils were compacted with a manually operated compactor and the disturbed areas were then re-seeded. This completed the field activities.

LABORATORY TESTING

Soil Cover and Clay Liner

Laboratory testing was performed on undisturbed soil samples of both the protective cover soils and clay liner taken from both sample locations. Tests were made on one sample from the soil cover at a depth of zero to approximately 22 inches at each location, and two samples from underlying clay liner at depths of approximately two to four feet (below the ground surface) at each location. The testing consisted of unit weight, Atterberg limits, grain size analysis, moisture content, specific gravity and permeability testing. GeoTesting Express of Acton, Massachusetts performed the soil laboratory testing.

Based on the unified soil classification system, the cover soil and clay liner soils both classify as a silty clay, CH. The in-place densities and moisture contents appear to indicate that a reasonable compaction effort was performed on both the cover soils and clay liner during construction. The laboratory permeability test results indicate a permeability of 4.2×10^{-8} cm/sec on the cover soil sample, and a permeability of 1.5 and 3.6 $\times 10^{-8}$ cm/sec on the clay liner samples. These permeability values are less than the 1×10^{-7} cm/sec., which are normally required for landfill clay liners; this indicates that the samples tested have a permeability les than that typically specified for landfill clay liners. A summary of the laboratory testing results is included on Table 1. Data sheets for the laboratory testing is included in Appendix I. The complete soil laboratory testing report by GeoTesting Express has been submitted previously under a separate cover.

TABLE 1

SUMMARY OF LABORATORY TEST DATA OF SOIL LINER
WARREN COUNTY PCB LANDFILL
S&ME Project No. 1054-97-670

Sample Location No.	Sample Depth (Ft)	Sample Type •	USCS Classification	Natural Moisture Content (%)	% Finer No. 200	Atterberg Limits		Proctor Data		In Situ Conditions				Hydraulic Conductivity k (cm/sec)
						LL	PI	Max. Dry Density (pcf)	Opt. Moisture Content (%)	Specific Gravity	Porosity	Dry Density (pcf)	Moisture Content (%)	
B-1/ST-2*	0-2	UD	CH	30.2	74	72.5	45.8	---	---	2.69	---	92.5	30.2	---
B-1/ST-3**	2-4	UD	CH	31.3	71	73.6	42.9	---	---	2.74	---	93.9	31.3	3.6E-08
B-2/ST-2*	0-2	UD	CH	29.9	71	65.2	37.0	---	---	2.71	---	93.1	29.9	4.2E-08
B-2/ST-4**	2-4	UD	CH	32.7	75	62.9	32.8	---	---	2.74	---	90.5	32.7	1.5E-08

Note: Graphic Presentations of Results of Grain Size, and other tests are included in Appendix I.

• SS = Split Spoon Sample (ASTM D-1586)
UD = Undisturbed Sample (ASTM D-1587)
BG = Bulk Sample
* = Cover Soils
** = Liner Soils

PVC Liner

As discussed previously, PVC liner Sample B-1 was cleaned and delivered to Singleton Labs, Inc., and PVC liner Sample B-2 was cleaned and delivered to our Charlotte laboratory. Both samples were tested in accordance with applicable American Society for Testing and Materials (ASTM) Standards.

Sample B-1 tests included thickness, density, tear resistance, tensile properties, and dimensional stability. Test results are included in Table 2. Determination of the thickness of a PVC liner is performed by averaging thickness measurements across a sample. Density or specific gravity of a PVC liner is dependent on the manufacturing material weight of an object in air divided by its weight in water. The tear resistance test, as its name implies, is a measure of the force necessary to initiate a tear in a PVC liner sheet. Tensile properties represent the maximum force required to cause tension failure in a given test sample. Elongation at break represents the percent of change in length during the tensile testing on a PVC liner. Dimensional stability is intended as an index test to determine the stability of non-rigid plastic PVC liner specimens at specified elevated temperature and exposure time.

Sample B-2 tests included bonded shear strength and peel adhesion tests on the PVC liner seam. Test results are included in Table 2. Shear and peel testing is performed on PVC liner seams for quality control purposes. These tests are used as an indicator that the apparent strength of the bond is greater than the strength of the parent material.

TABLE 2
SUMMARY OF LABORATORY TESTING ON PVC LINER

Property	Test Method	10-mil PVC Specimen	Typical 10-mil PVC*
Thickness, (mils)	ASTM D751	9.6	9.5
Density, (g/cc)	ASTM D792	1.301	1.2
Tear Resistance, (lbs), MD/TD	ASTM D1004	4.48/4.17	3.2
Tensile Properties	ASTM D882		
Break Strength, (lbs/in), MD/TD		28.68/26.05	25
Tensile Strength at break, (psi), MD/TD		2987/2713	---
Elongation at Break, (%), MD/TD		281/236	350
Dimensional Stability, (%), MD/TD	ASTM D1024	-5.37/-1.2, -6.73/-3.19	±4
Bonded Shear Strength, (lbs)	ASTM D3083	23.7	20
Peel Adhesion, (lbs)	ASTM D413	5.3	10

MD/TD = manufacturing Machine Direction/ Transverse Direction

*Provided by PVC Geomembrane Institute

CONCLUSIONS

Soil Cover and Clay Liner

Based on the field and laboratory testing performed, the soil cover and clay liner *at the locations sampled* appear to be in good condition and providing permeability values typically acceptable for clay liners in landfills.

The soil cover had a good stand of grass and showed no evidence of erosion. The soil cover type and thickness varied from the as-built construction drawing which indicated a one-foot thick topsoil layer over a one-foot thick protective soil cover. The in-place soil cover consists of a 22-inch thick clayey soil layer.

The clay liner *at the locations sampled* had no visual evidence of desiccation cracks or softness. Based on the density and moisture content tests, it appears that the soil liner received a reasonable compaction effort. Also, the permeability tests performed are indicative of well-compacted clays based on our experience with similar type soils. The permeability test results indicate a lower permeable soil liner than typically specified for the soil component of a solid waste landfill cover system.

Based on the above limited field observations and laboratory test results, the soil cover and underlying clay liner beneath the PVC liner at the locations sampled appear to be providing satisfactory performance.

PVC Liner

Based on our limited field observations, the PVC liner *at the locations sampled* appears to be in fair condition. The seams showed signs of root penetration along several seam sections. Pinholes were observed in PVC Sample B-1, although some of the pinholes may have resulted

How many?

from damage during excavation of the soil cover. No pinholes were observed in PVC liner Sample B-2. The PVC liner at both locations appeared to be intact with no noted signs of excessive deterioration.

The laboratory test results indicate that some diminishing in the original PVC properties has occurred over time. The original material specifications for 10-mil PVC were not available to compare laboratory results; however, properties were compared with current typical specifications issued by the PVC Geomembrane Institute. The typical specifications are shown in Table 2 for reference.

not a fair comparison

The specific gravity of the PVC appears to be somewhat greater than the current specifications. This increase is consistent with a loss of plasticizer in an aged PVC sample. Along with the loss of plasticizer, the sample's tensile strength should increase. The laboratory test results for tensile strength are typically greater than the current typical specifications for break strength; however, elongation test results indicate an elongation of about 20 to 30 percent below the current typical specifications which may also be indicative of a loss of plasticizer.

The dimensional stability of the PVC indicates lower test results in the machine direction than current typical specifications. This may be a result of degradation of the material as noted above.

The results of the peel adhesion test performed on the seam sample indicate that the 10-mil PVC has loss some seam integrity. The peel test results were below current typical specifications. The low peel test results may be a result of the root penetration or a degradation of plasticizers within the PVC liner and PVC glue used to bond the seams.

The changes in properties of the PVC noted above are consistent with changes associated with plasticizer loss. These results are comparable to other testing reports of PVC cover systems such as "Examination of PVC in a 'Top Cap' Application" by Samuel B. Levin and Mark D.

Hammond, published in *Geosynthetic Testing for Waste Containment Applications, ASTM STP 1081*, edited by R.M. Koerner, dated 1990.

QUALIFICATIONS OF REPORT

Our evaluation of the Warren County PCB Landfill cap was completed in conjunction with procurement of landfilled soils for pilot bench testing which resulted in the number of sample locations for our evaluation being limited to two. Two sample locations do not provide adequate data to statistically evaluate such items as determination of variance, confidence intervals, etc. To gain a reasonable understanding of the landfills' overall condition, there must be a significantly larger number of sample locations. Accordingly, our investigation, test results and conclusions are indicative of conditions at the specific sample locations and should *not* be interpreted to represent conditions across the entire landfill.

Our evaluation was performed in general accordance with our Work Plan for Excavation, Handling, and Storage of PCB Contaminated Soils, dated February 13, 1997. Recommendations for remedial action in regards to the cover soil and liner system were beyond the scope of our services. Observations and conclusions contained in this report are based on our experience with landfill liner systems and current industry design and construction standards.

CLOSING

S&ME appreciates the opportunity to be of service to the North Carolina Department of Environment, Health, and Natural Resources. If you have any questions or require additional information, please contact us.

Sincerely,

S&ME, Inc.

NORTH CAROLINA PROFESSIONAL SEAL 17582 ENGINEER DAN E. BREWER

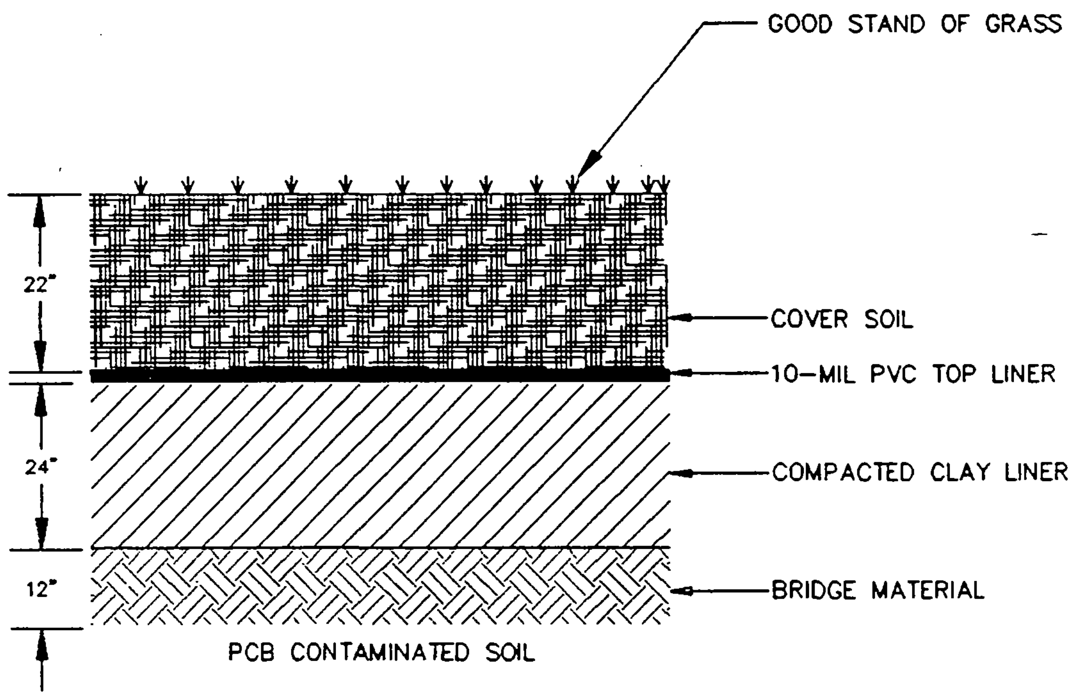
Dan E. Brewer

Dan E. Brewer, P.E.
Landfill Services Manager
N.C. Registration No. 17582

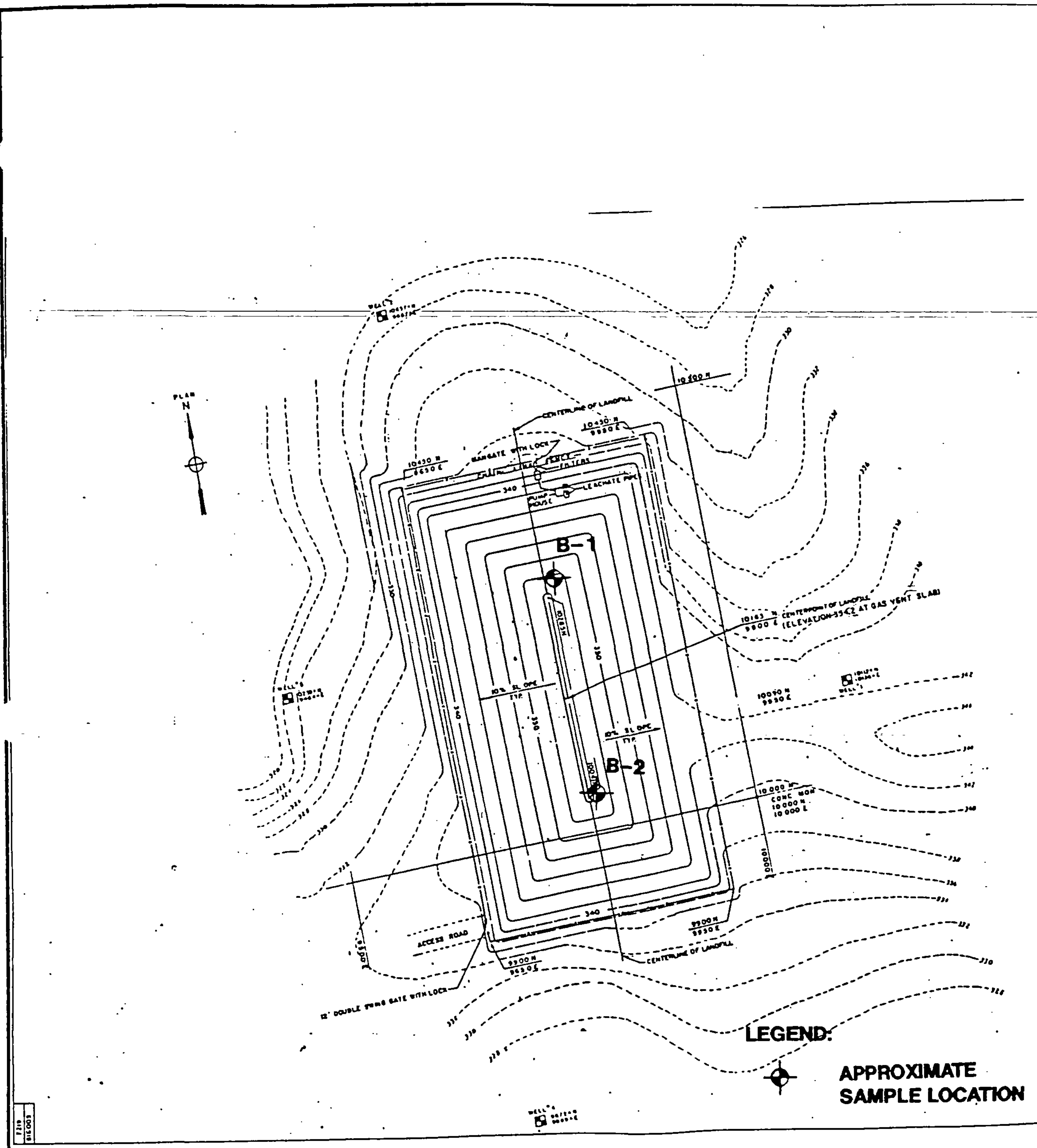
Jack J. Amar, P.E.
Vice President
N.C. Registration No. 10861

cc: Donald F. Carter, P.E., S&ME, Inc.
Doris Fleetwood, Warren County PCB Working Group
Patrick A. Barnes, P.G., BFA Environmental Consultants
Joel S. Hirschhove, Hirschhove & Associates

FIGURES



LE: NTS	S&ME ENVIRONMENTAL SERVICES ENGINEERING · TESTING	**TYPICAL SECTION THRU LANDILL COVER** PCB WASTE DISPOSAL SITE WARREN COUNTY, NORTH CAROLINA	FIGURE NO. **1**
CHECKED BY:			
DRAWN BY: CLD			
DATE: 6-2-97		JOB NO: 1054-97-670	



EFERENCE: FINAL GRADING PLAN BY SVERDRUP & PARCEL DATED 8-12-81

SCALE: NTS	S&ME ENVIRONMENTAL SERVICES ENGINEERING · TESTING	**SAMPLE LOCATION PLAN** PCB WASTE DISPOSAL SITE WARREN COUNTY, NORTH CAROLINA	FIGURE NO.	**2**
CHECKED BY:				
DRAWN BY: CLD				
DATE: 6-5-97		JOB NO: 1054-97-670		

APPENDIX I
COVER SOIL AND LINER SOIL LABORATORY TEST RESULTS

GeoTesting Express • Acton, Ma. • (508) 635-0424 • Fax (508) 635-0266

Density of Undisturbed Soil Samples

Client: S & ME
Project: Warren County PCB Landfill
Location: Afton, NC

GTX#: 1380
Date: 03/24/97

Boring #	Sample ID	Depth, ft	Sample Description	Soil Diameter, in	Soil Height, in	Bulk Density, pcf	Moisture Content, %	Dry Density, pcf
B-1	ST-2	0-2	Yellowish red clay with sand	2.86	1.97	120.4	30.2	92.5
	ST-3	2-4	Yellowish red clay with sand	2.86	1.23	123.2	31.3	93.9
B-2	ST-2	0-2	Yellowish red clay with sand	2.87	5.36	121.0	29.9	93.1
	ST-4	2-4	Yellowish red clay with sand	2.87	6.10	120.1	32.7	90.5

Notes: Samples delivered to GeoTesting Express in thin-walled Shelby tubes (ASTM D 1587), outside diameter = 3 inch

Densities determined per ASTM D 2937: Density of Soil In Place by the Drive-Cylinder Method

Samples from cap

Specific Gravity by ASTM D854

Client: S & ME
Project: Warren County PCB Landfill
Location: Afton, NC

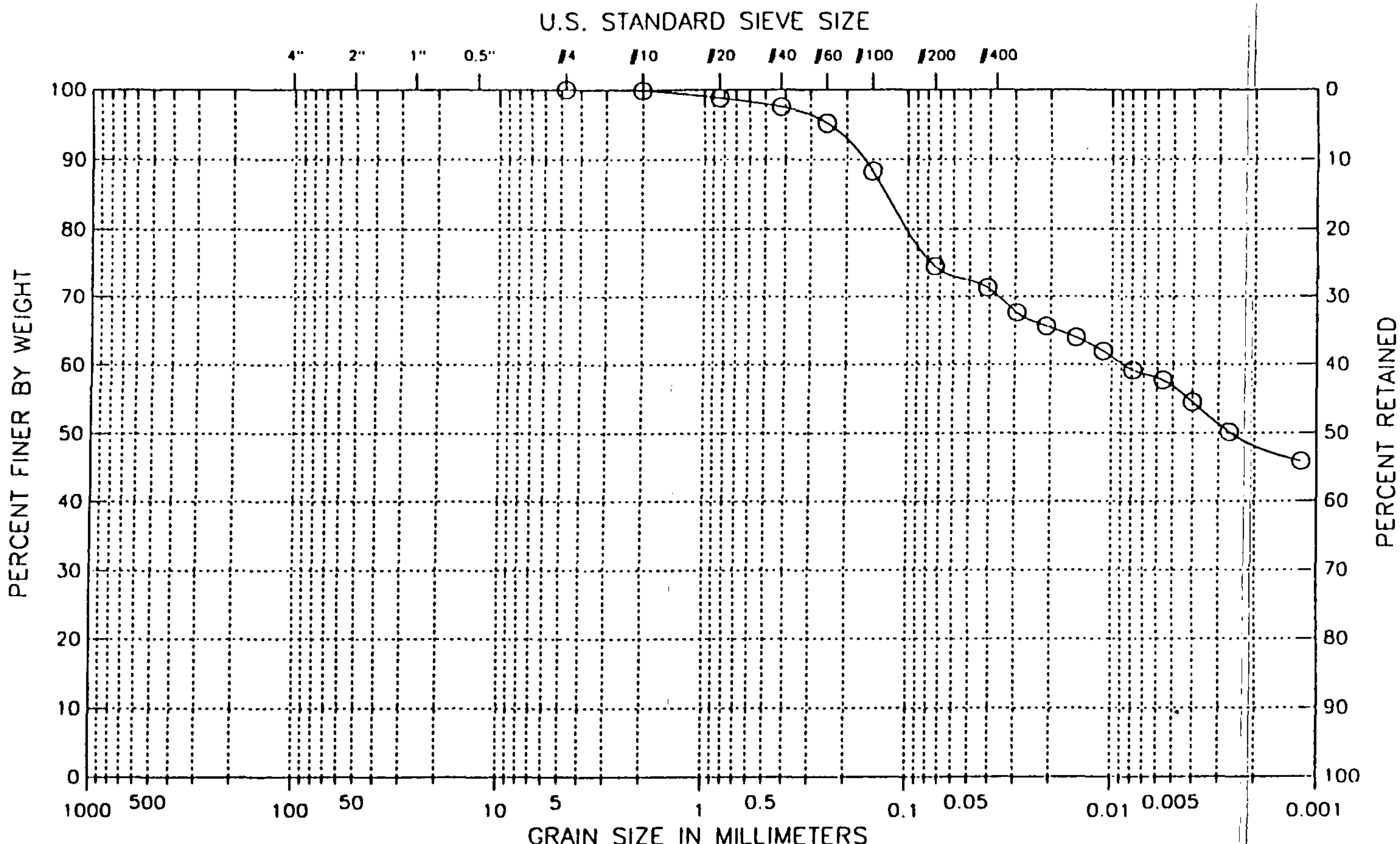
GTX#: 1380
Date: 03/24/97
Tested By: swj
Checked By: gtt

Boring #	Sample ID	Depth, ft	Description	Specific Gravity @ 20 °C
B-1	ST-2	0-2	Yellowish red clay with sand	2.69
	ST-3	2-4	Yellowish red clay with sand	2.74
B-2	ST-2	0-2	Yellowish red clay with sand	2.71
	ST-4	2-4	Yellowish red clay with sand	2.74

Notes: Samples from cap

Boring No. : B-1
Sample No: ST-2 (0-2)
Test Method ASTM D 422
Filename : B1ST202

Project : Warren County PCB Landfill
Project No.: GTX-1380
Location: Afton, NC
Date : Wed Apr 02 1997



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Classification :
(CH) fat clay with sand
Visual Description :
Yellowish red clay with sand

Remarks :

Figure 1

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GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-1
Sample No. : ST-2 (0-2)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 0-2 ft
Test Date : 03/24/97
Test Method : ASTM D 422

Filename : B1ST202
Elevation : ---
Tested by : djc
Checked by : gtt

HYDROMETER

Hydrometer ID : dist125
Weight of air-dried soil = 54.04 gm
Specific Gravity = 2.69

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	43.20	20.00	38.85	0.041	71	0.041
2.00	41.20	20.00	36.85	0.029	68	0.029
4.00	40.10	20.00	35.75	0.021	66	0.021
8.00	39.20	20.00	34.85	0.015	64	0.015
15.00	38.10	20.00	33.75	0.011	62	0.011
30.00	36.60	20.00	32.25	0.008	59	0.008
60.00	35.80	20.00	31.45	0.006	58	0.006
120.00	33.80	20.50	29.70	0.004	55	0.004
282.00	31.30	20.80	27.32	0.003	50	0.003
1442.00	28.90	21.10	24.98	0.001	46	0.001

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.07	0.07	100
#20	0.033	0.84	0.58	0.65	99
#40	0.017	0.42	0.70	1.35	98
#60	0.010	0.25	1.26	2.61	95
#100	0.006	0.15	3.71	6.32	88
#200	0.003	0.07	7.48	13.80	74
Pan			40.31	54.11	0

Total Dry Weight of Sample = 63.41

D85 : 0.1259 mm
D60 : 0.0087 mm
D50 : 0.0026 mm
D30 : N/A
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : CH
ASTM Group Name : fat clay with sand
AASHTO Group Symbol : A-7-6(41)
AASHTO Group Name : Clayey Soils

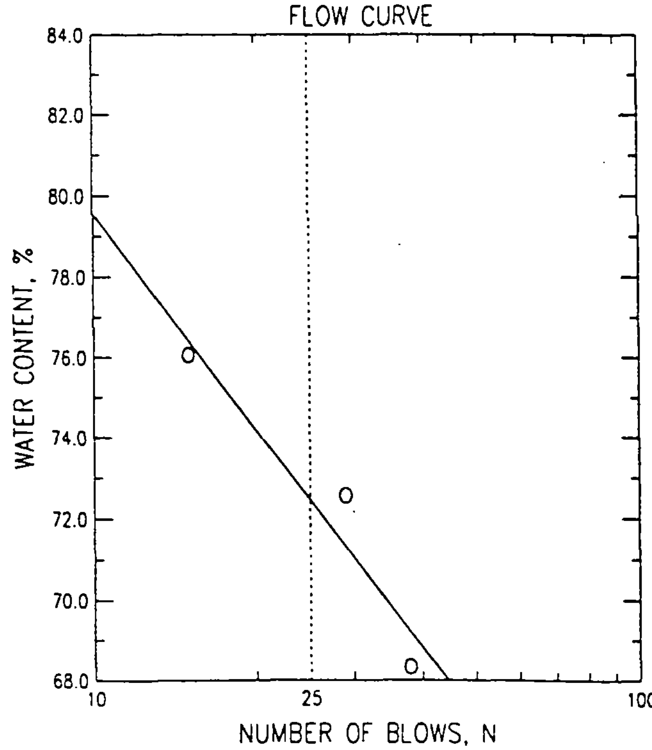
ATTERBERG LIMITS

PROJECT	PROJECT NUMBER	TESTED BY	BORING NUMBER
Warren County PCB Landfill	GTX-1380	djc	B-1
LOCATION		CHECKED BY	SAMPLE NUMBER
Afton, NC		glt	ST-2 (0-2)
SAMPLE DESCRIPTION		DATE	FILENAME
Yellowish red clay with sand		Wed Apr 02 1997	B1ST202

LIQUID LIMIT DETERMINATIONS					
CONTAINER NUMBER	v12	lt10	bb2		
WT. WET SOIL + TARE	5.37	4.26	4.76		
WT. DRY SOIL + TARE	4.14	3.44	3.68		
WT. WATER	1.23	0.82	1.08		
TARE WT.	2.34	2.31	2.26		
WT. DRY SOIL	1.8	1.13	1.42		
WATER CONTENT, W_N (%)	68.33	72.57	76.06		
NUMBER OF BLOWS, N	38	29	15		
ONE-POINT LIQUID LIMIT, LL	71.88	73.88	71.50		

PLASTIC LIMIT DETERMINATIONS					
CONTAINER NUMBER	bb5	s4			
WT. WET SOIL + TARE	4.01	3.26			
WT. DRY SOIL + TARE	3.65	3.06			
WT. WATER	0.36	0.2			
TARE WT.	2.33	2.29			
WT. DRY SOIL	1.32	0.77			
WATER CONTENT (%)	27.27	25.97			

FLOW CURVE



SUMMARY OF RESULTS	
NATURAL WATER CONTENT, W (%)	30.2
LIQUID LIMIT, LL	72.5
PLASTIC LIMIT, PL	26.6
PLASTICITY INDEX, PI	45.8
LIQUIDITY INDEX, LI*	0.08

*LI = (W - PL)/PI

PLASTICITY CHART

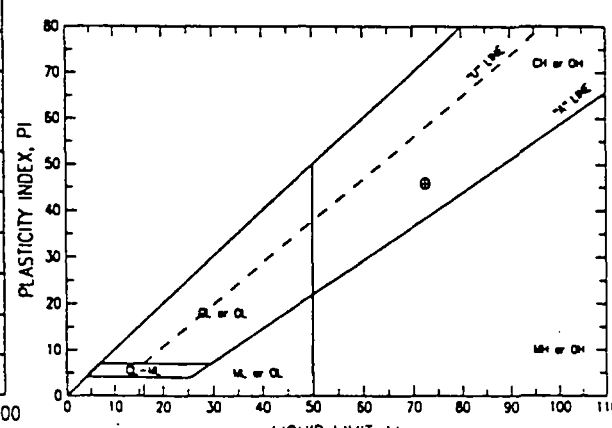


Fig. 1.0

GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-1
Sample No. : ST-2 (0-2)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 0-2 ft
Test Date : 03/24/97
Test Method : ASTM D 2216

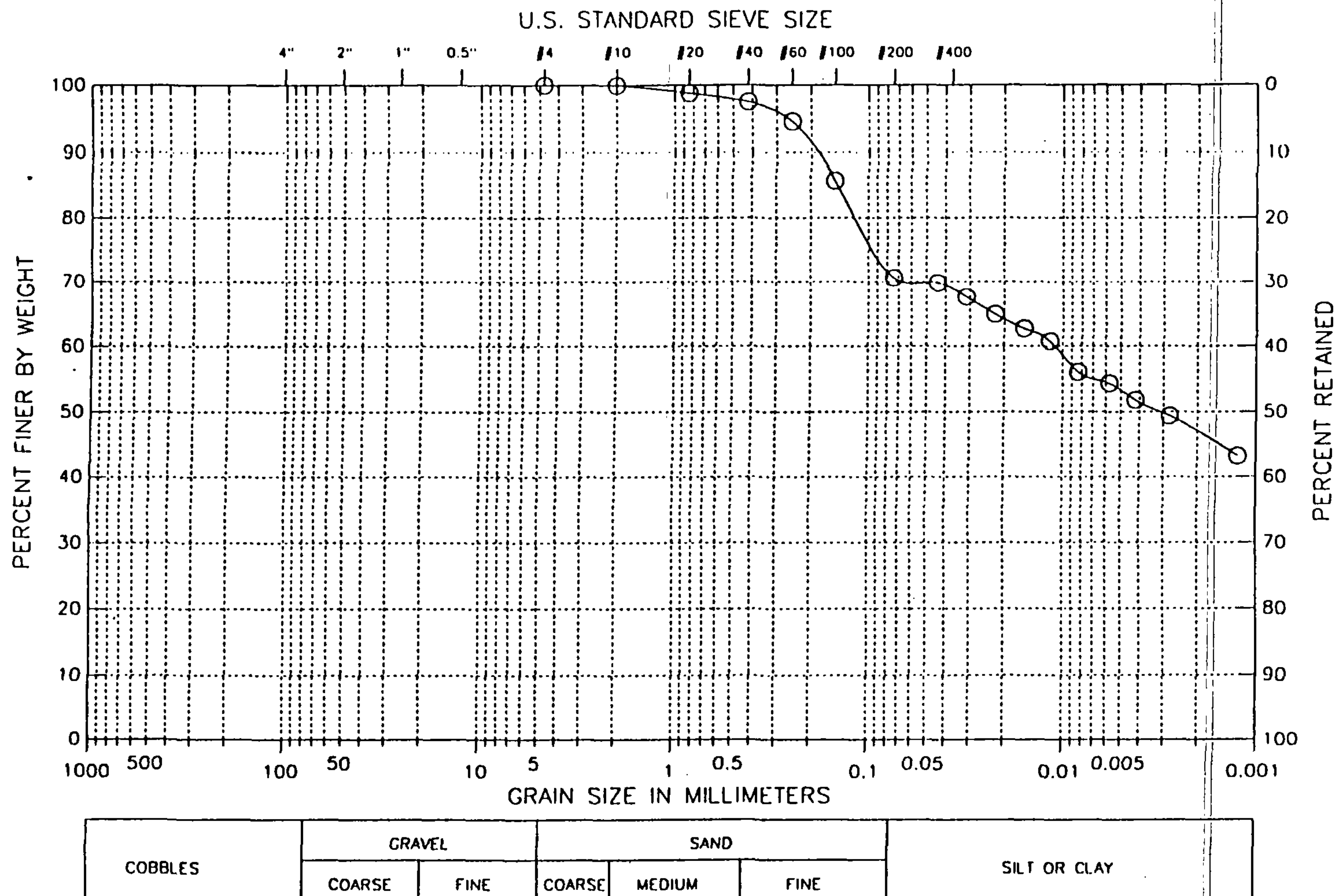
Filename : B1ST202
Elevation : ---
Tested by : djc
Checked by : gtt

Natural Moisture Content

Moisture Content ID	Mass of Container (gm)	Mass of Container and Moist Soil (gm)	Mass of Container and Dried Soil (gm)	Moisture Content (%)
1) b1d26	9.36	111.09	87.50	30.19

Average Moisture Content = 30.19

Boring No. : B-1	Project : Warren County PCB Landfill
Sample No.: ST-3 (2-4)	Project No.: GTX-1380
Test Method ASTM D 422	Location: Afton, NC
Filename : B1ST324	Date : Wed Apr 02 1997



Classification :
(CH) fat clay with sand
Visual Description :
Yellowish red clay with sand

Remarks :

Figure 2

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GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-1
Sample No. : ST-3 (2-4)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 2-4 ft
Test Date : 03/24/97
Test Method : ASTM D 422

Filename : B1ST324
Elevation : ---
Tested by : djc
Checked by : gtt

HYDROMETER

Hydrometer ID : dist125
Weight of air-dried soil = 40.01 gm
Specific Gravity = 2.74

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	32.80	20.00	28.45	0.044	70	0.044
2.00	31.90	20.00	27.55	0.031	68	0.031
4.00	30.80	20.00	26.45	0.022	65	0.022
8.00	29.90	20.00	25.55	0.016	63	0.016
15.00	29.10	20.00	24.75	0.012	61	0.012
30.00	27.20	20.00	22.85	0.008	56	0.008
64.00	26.50	20.00	22.15	0.006	54	0.006
120.00	25.20	20.50	21.10	0.004	52	0.004
274.00	24.10	20.80	20.12	0.003	49	0.003
1430.00	21.50	21.10	17.58	0.001	43	0.001

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.02	0.02	100
#20	0.033	0.84	0.47	0.49	99
#40	0.017	0.42	0.54	1.03	97
#60	0.010	0.25	1.17	2.20	95
#100	0.006	0.15	3.52	5.72	86
#200	0.003	0.07	6.05	11.77	71
Pan			28.26	40.03	0

Total Dry Weight of Sample = 49.58

D85 : 0.1442 mm
D60 : 0.0110 mm
D50 : 0.0031 mm
D30 : N/A
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : CH
ASTM Group Name : fat clay with sand
AASHTO Group Symbol : A-7-5(36)
AASHTO Group Name : Clayey Soils

ATTERBERG LIMITS

PROJECT	PROJECT NUMBER	TESTED BY	BORING NUMBER
Warren County PCB Landfill	GTX-1380	djc	B-1
LOCATION: Afton, NC		CHECKED BY: gtt	SAMPLE NUMBER: ST-3 (2-4)
SAMPLE DESCRIPTION: Yellowish red clay with sand		DATE: Wed Apr 02 1997	FILENAME: B1ST324

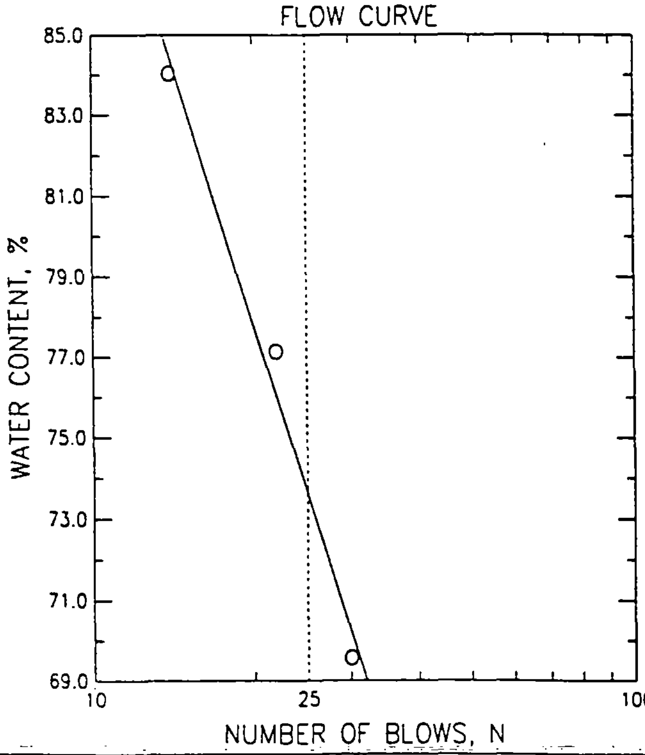
LIQUID LIMIT DETERMINATIONS

CONTAINER NUMBER	lt1	6a	v4		
WT. WET SOIL + TARE	4.62	4.17	4.48		
WT. DRY SOIL + TARE	3.66	3.36	3.48		
WT. WATER	0.96	0.81	1		
TARE WT.	2.28	2.31	2.29		
WT. DRY SOIL	1.38	1.05	1.19		
WATER CONTENT, W_N (%)	69.57	77.14	84.03		
NUMBER OF BLOWS, N	30	22	14		
ONE-POINT LIQUID LIMIT, LL	71.12	75.96	78.34		

PLASTIC LIMIT DETERMINATIONS

CONTAINER NUMBER	6c	csn			
WT. WET SOIL + TARE	3.67	3.89			
WT. DRY SOIL + TARE	3.35	3.51			
WT. WATER	0.32	0.38			
TARE WT.	2.32	2.26			
WT. DRY SOIL	1.03	1.25			
WATER CONTENT (%)	31.07	30.40			

FLOW CURVE



SUMMARY OF RESULTS	
NATURAL WATER CONTENT, W (%)	31.3
LIQUID LIMIT, LL	73.6
PLASTIC LIMIT, PL	30.7
PLASTICITY INDEX, PI	42.9
LIQUIDITY INDEX, LI*	0.01

*LI = (W − PL)/PI

PLASTICITY CHART

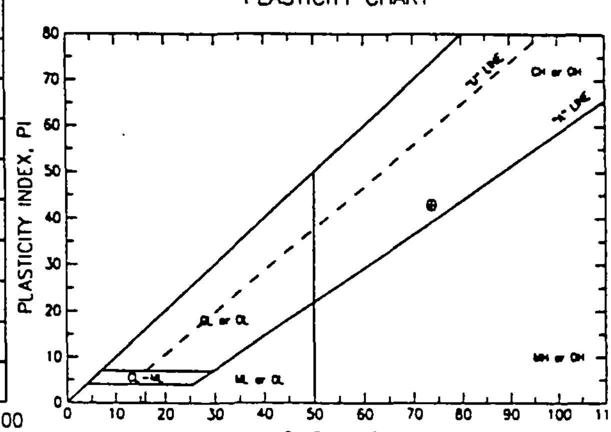


Fig. 2.0

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GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-1
Sample No. : ST-3 (2-4)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 2-4 ft
Test Date : 03/24/97
Test Method : ASTM D 2216

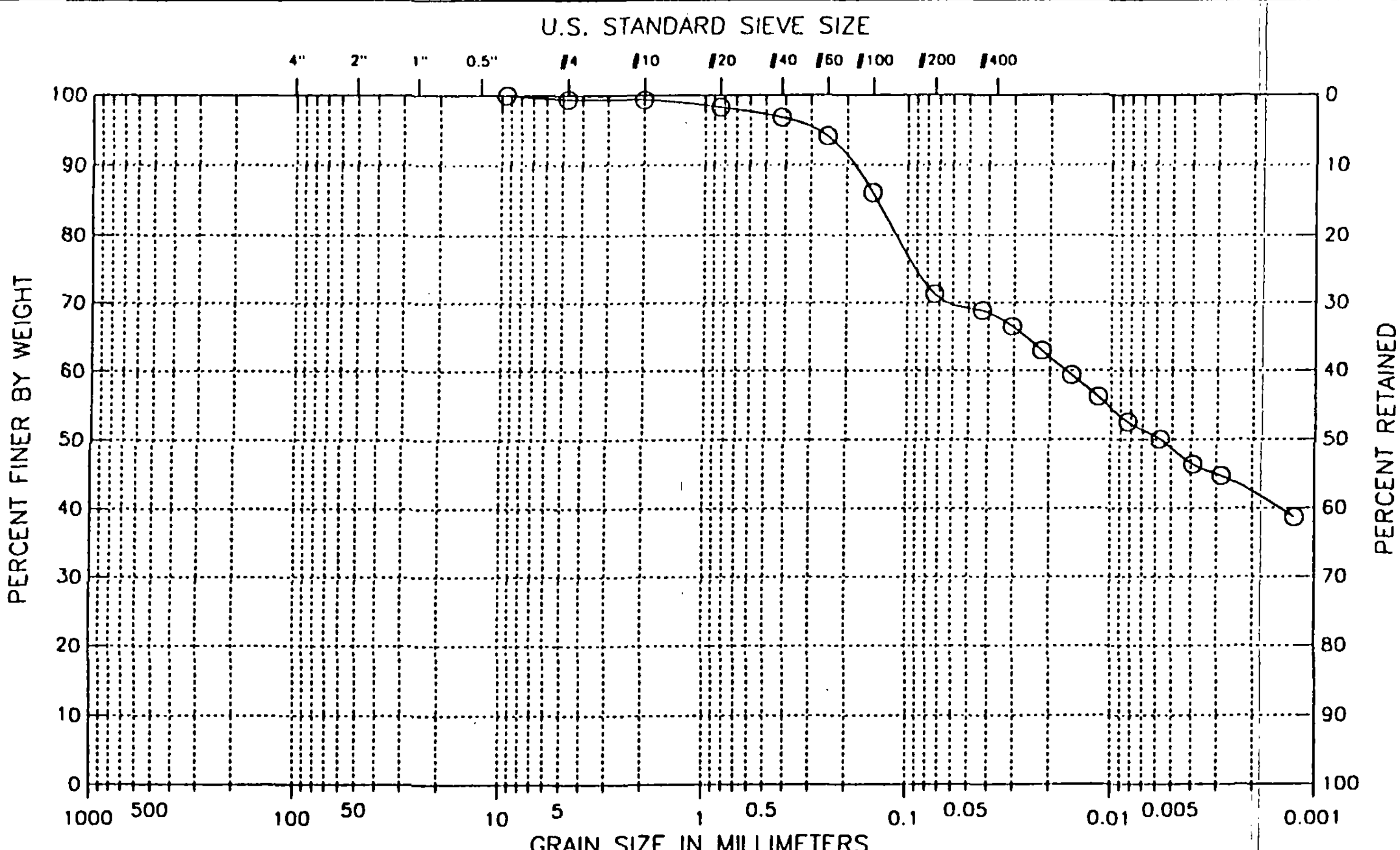
Filename : B1ST324
Elevation : ---
Tested by : djc
Checked by : gtt

Natural Moisture Content

Moisture Content ID	Mass of Container (gm)	Mass of Container and Moist Soil (gm)	Mass of Container and Dried Soil (gm)	Moisture Content (%)
1) yu28	9.31	62.56	49.88	31.25

Average Moisture Content = 31.25

Boring No. : B-2 Sample No.: ST-2 (0-2) Test Method ASTM D 422 Filename : B2ST202	Project : Warren County PCB Landfill Project No.: GTX-1380 Location: Afton, NC Date : Wed Apr 02 1997



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Classification :
(CH) fat clay with sand

Visual Description :
Yellowish red clay with sand

Remarks :

Figure 3

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GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-2
Sample No. : ST-2 (0-2)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 0-2 ft
Test Date : 03/24/97
Test Method : ASTM D 422

Filename : B2ST202
Elevation : ---
Tested by : djc
Checked by : gtt

HYDROMETER

Hydrometer ID : dist125
Weight of air-dried soil = 46.44 gm
Specific Gravity = 2.71

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	36.90	20.00	32.55	0.043	69	0.043
2.00	35.80	20.00	31.45	0.031	67	0.031
4.00	34.10	20.00	29.75	0.022	63	0.022
8.00	32.40	20.00	28.05	0.016	59	0.016
15.00	30.90	20.00	26.55	0.012	56	0.012
30.00	29.20	20.00	24.85	0.008	53	0.008
64.00	28.00	20.00	23.65	0.006	50	0.006
140.00	26.00	20.50	21.90	0.004	46	0.004
266.00	25.10	20.80	21.12	0.003	45	0.003
1418.00	22.20	21.10	18.28	0.001	39	0.001

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.27	0.27	99
#10	0.079	2.00	0.03	0.30	99
#20	0.033	0.84	0.51	0.81	98
#40	0.017	0.42	0.69	1.50	97
#60	0.010	0.25	1.26	2.76	94
#100	0.006	0.15	3.72	6.48	86
#200	0.003	0.07	6.95	13.43	71
Pan			33.31	46.74	0

Total Dry Weight of Sample = 56.09

D85 : 0.1412 mm
D60 : 0.0167 mm
D50 : 0.0057 mm
D30 : N/A
D15 : N/A
D10 : N/A

Soil Classification
ASTM Group Symbol : CH
ASTM Group Name : fat clay with sand
AASHTO Group Symbol : A-7-6(31)
AASHTO Group Name : Clayey Soils

ATTERBERG LIMITS

PROJECT	PROJECT NUMBER	TESTED BY	BORING NUMBER
Warren County PCB Landfill	GTX-1380	djc	B-2
LOCATION Afton, NC		CHECKED BY gtt	SAMPLE NUMBER ST-2 (0-2)
SAMPLE DESCRIPTION Yellowish red clay with sand		DATE Wed Apr 02 1997	FILENAME B2ST202

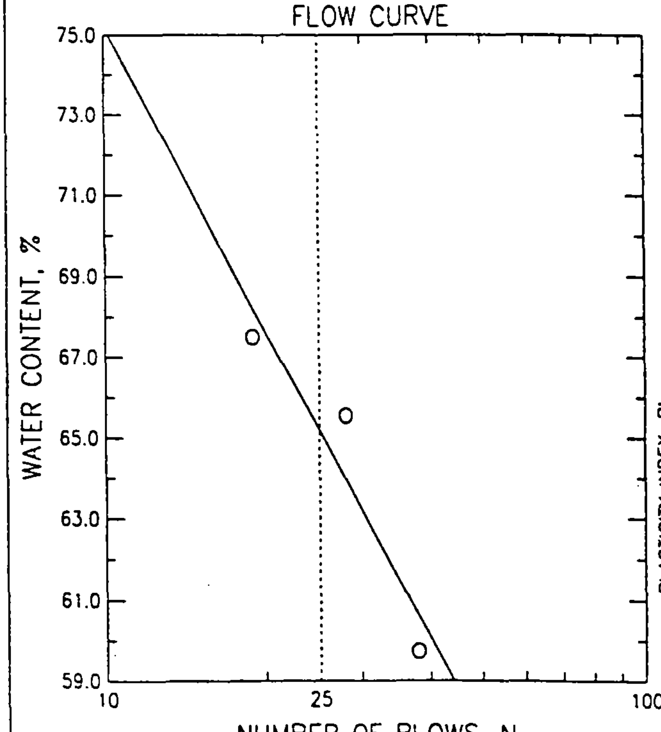
LIQUID LIMIT DETERMINATIONS

CONTAINER NUMBER	it5	24	17		
WT. WET SOIL + TARE	4.67	21.84	23.06		
WT. DRY SOIL + TARE	3.78	21.06	21.71		
WT. WATER	0.89	0.78	1.35		
TARE WT.	2.29	19.87	19.71		
WT. DRY SOIL	1.49	1.19	2		
WATER CONTENT, W_N (%)	59.73	65.55	67.50		
NUMBER OF BLOWS, N	38	28	19		
ONE-POINT LIQUID LIMIT, LL	62.84	66.45	65.30		

PLASTIC LIMIT DETERMINATIONS

CONTAINER NUMBER	it7	002			
WT. WET SOIL + TARE	3.45	3.58			
WT. DRY SOIL + TARE	3.21	3.3			
WT. WATER	0.24	0.28			
TARE WT.	2.35	2.32			
WT. DRY SOIL	0.86	0.98			
WATER CONTENT (%)	27.91	28.57			

FLOW CURVE



SUMMARY OF RESULTS

NATURAL WATER CONTENT, W (%)	29.9
LIQUID LIMIT, LL	65.2
PLASTIC LIMIT, PL	28.2
PLASTICITY INDEX, PI	37.0
LIQUIDITY INDEX, LI*	0.05

*LI = (W − PL)/PI

PLASTICITY CHART

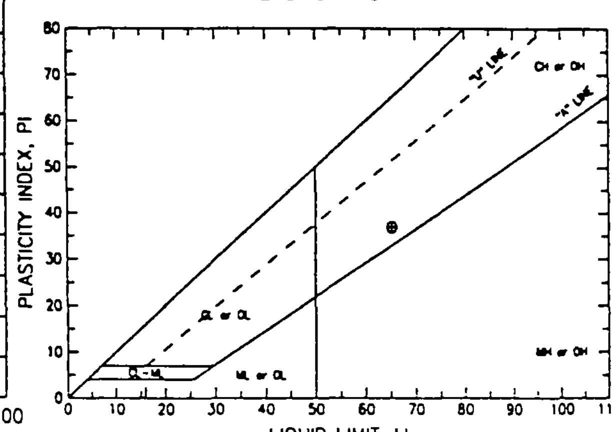


Fig. 3.0

GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-2
Sample No. : ST-2 (0-2)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 0-2 ft
Test Date : 03/24/97
Test Method : ASTM D 2216

Filename : B2ST202
Elevation : ---
Tested by : djc
Checked by : gtt

Natural Moisture Content

Moisture Content ID	Mass of Container (gm)	Mass of Container and Moist Soil (gm)	Mass of Container and Dried Soil (gm)	Moisture Content (%)
1) rx23	9.24	109.57	86.45	29.94

Average Moisture Content = 29.94

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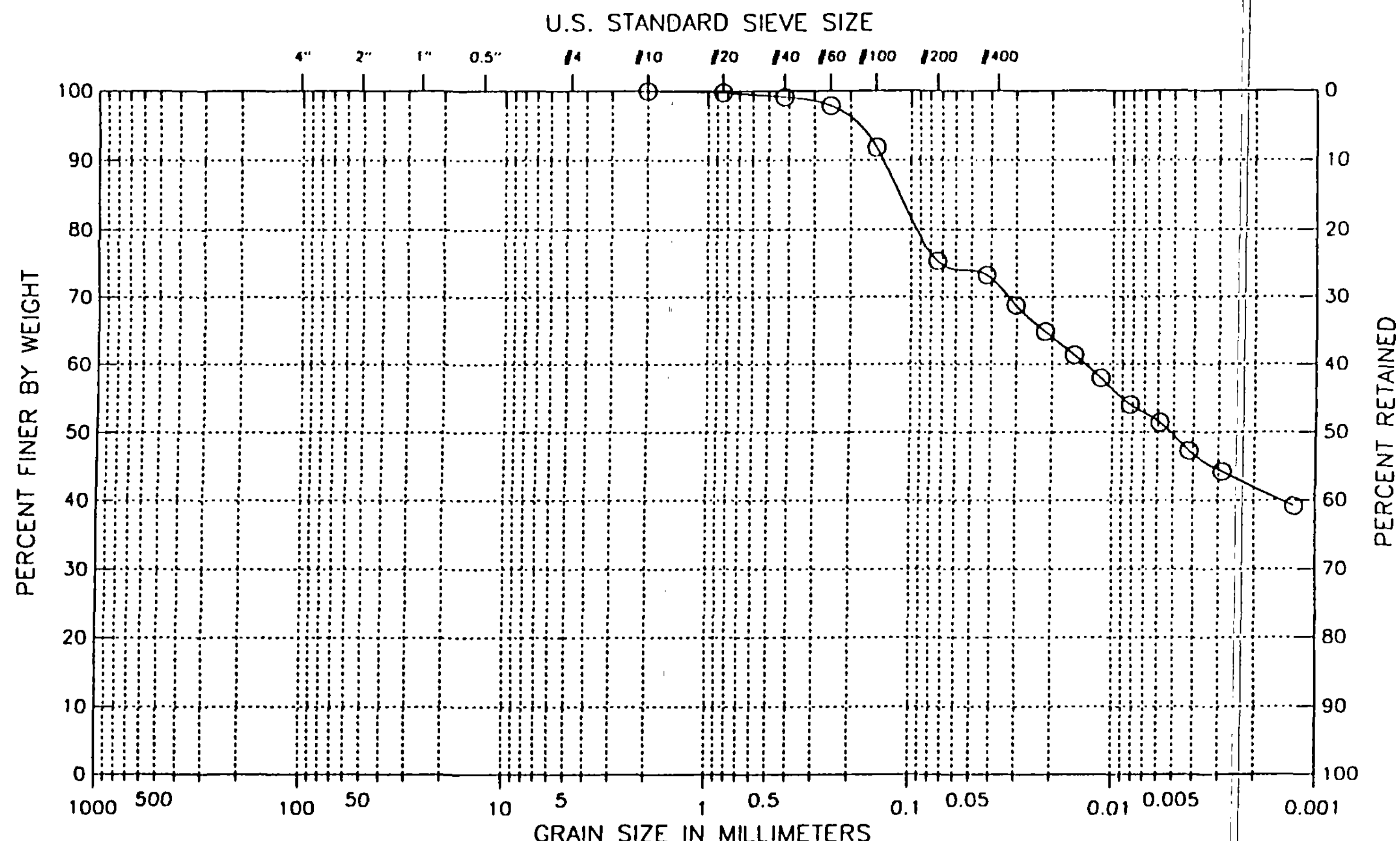
	Boring No. : B-2 Sample No.: ST-4 (2-4) Test Method ASTM D 422 Filename : B2ST424	Project : Warren County PCB Landfill Project No.: GTX-1380 Location: Afton, NC Date : Wed Apr 02 1997



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Classification :
(CH) fat clay with sand

Visual Description :
Yellowish red clay with sand

Remarks :

Figure 4

ATTERBERG LIMITS

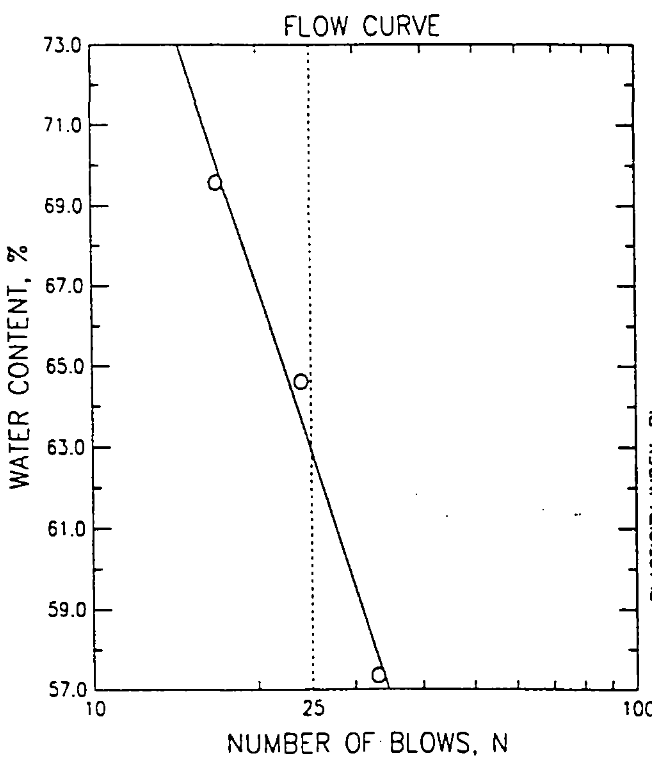
PROJECT Warren County PCB Landfill	PROJECT NUMBER GTX-1380	TESTED BY djc	BORING NUMBER B-2
LOCATION Afton, NC		CHECKED BY gtt	SAMPLE NUMBER ST-4 (2-4)
SAMPLE DESCRIPTION Yellowish red clay with sand		DATE Wed Apr 02 1997	FILENAME B2ST424

LIQUID LIMIT DETERMINATIONS

CONTAINER NUMBER	72	41	15		
WT. WET SOIL + TARE	24.52	24.49	22.45		
WT. DRY SOIL + TARE	23.7	23.65	21.65		
WT. WATER	0.82	0.84	0.8		
TARE WT.	22.27	22.35	20.5		
WT. DRY SOIL	1.43	1.3	1.15		
WATER CONTENT, W_N (%)	57.34	64.62	69.57		
NUMBER OF BLOWS, N	33	24	17		
ONE-POINT LIQUID LIMIT, LL	59.30	64.30	66.39		

PLASTIC LIMIT DETERMINATIONS

CONTAINER NUMBER	lt4	lt2			
WT. WET SOIL + TARE	3.41	3.96			
WT. DRY SOIL + TARE	3.15	3.57			
WT. WATER	0.26	0.39			
TARE WT.	2.26	2.31			
WT. DRY SOIL	0.89	1.26			
WATER CONTENT (%)	29.21	30.95			



SUMMARY OF RESULTS

NATURAL WATER CONTENT, W (%)	32.7
LIQUID LIMIT, LL	62.9
PLASTIC LIMIT, PL	30.1
PLASTICITY INDEX, PI	32.8
LIQUIDITY INDEX, LI*	0.08

*LI = (W − PL)/PI

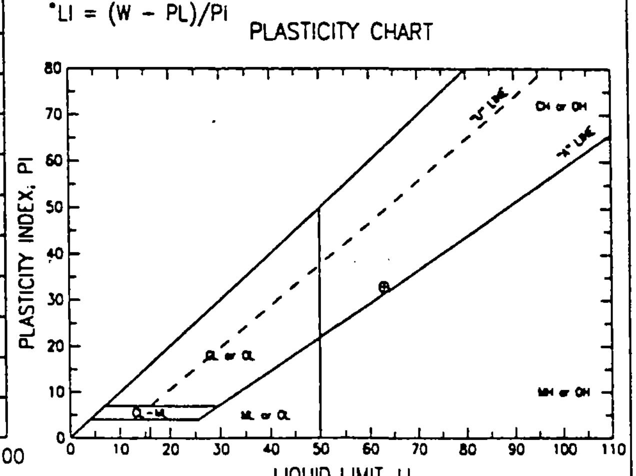


Fig. 4.0

GEOTECHNICAL LABORATORY TEST DATA

Project : Warren County PCB Landfill
Project No. : GTX-1380
Boring No. : B-2
Sample No. : ST-4 (2-4)
Location : Afton, NC
Soil Description : Yellowish red clay with sand
Remarks : ---

Depth : 2-4 ft
Test Date : 03/24/97
Test Method : ASTM D 2216

Filename : B2ST424
Elevation : ---
Tested by : djc
Checked by : gtt

Natural Moisture Content

Moisture Content ID	Mass of Container (gm)	Mass of Container and Moist Soil (gm)	Mass of Container and Dried Soil (gm)	Moisture Content (%)
1) 1x4	9.21	117.59	90.88	32.70

Average Moisture Content = 32.70

Hydraulic Conductivity Using Flex Wall Permeameter by ASTM D5084 (CONSTANT VOLUME)

LAB DATA SHEET

PROJECT/SAMPLE INFO:

CLIENT: S & ME	GTX #: 1380	START DATE: 03/28/97
PROJECT: Warren County PCB Landfill	TESTED BY: swj	END DATE: 03/31/97
LOCATION: Afton, NC	CHECKED BY: gtt	SAMPLE TYPE: Undisturbed
SAMPLE #: ST-3	BORING #: B-1	DEPTH: 2-4 ft
VISUAL DESCRIPTION & PREPARATION: (clay cap material) Yellowish red clay with sand. Sample extruded from tube, cut trimmed and placed into permeameter at as received conditions.		

TEST SETUP:

SAMPLE ORIENTATION: vertical	PERMEANT FLUID: deaired tap water	CELL #: 7

SAMPLE CONDITIONS:

INITIAL		FINAL	
a) length of specimen, in	2.43	k) length of specimen, in	2.43
b) diameter of specimen, in	2.875	l) diameter of specimen, in	2.875
c) area [(b^2/4) * 3.14], in ^{2}	6.49	m) area [(l^2/4) * 3.14], in ^{2}	6.49
d) volume (0.7854 * a * b^2), in ^{3}	15.78	n) volume (0.7854 * k * l^2), in ^{3}	15.78
e) mass of specimen, g	485	o) mass of specimen, g	490
f) bulk density [(e * 3.8095)/d], pcf	117.1	p) bulk density ((o * 3.8095)/n), pcf	118.3
MOISTURE CONTENT: Tare ID	be44	MOISTURE CONTENT: Tare ID	ur7
g) wet mass and tare, g	244.23	q) wet mass and tare, g	499
h) dry mass and tare, g	188.46	r) dry mass and tare, g	378
i) tare mass, g	9.38	s) tare mass, g	10
j) moisture content [(g-h)/(h-i)] * 100, %	31.1	t) moisture content [(q-r)/(r-s)] * 100, %	32.9
k) dry density [f/(1+(j/100))], pcf	89.3	u) dry density [p/(1+(t/100))], pcf	89.1

B COEFFICIENT DETERMINATION:

Date	Cell Pressure, psi	Pressure Increment, psi	Sample Pressure, psi	B Coefficient
03/31	110	5	105	0.95 (assumed)

FLOW DATA: CONSTANT VOLUME

Date	Trial #	Cell Pressure, psi	Sample Pressure, psi	Z_1	Z_2	ΔZ	Time, sec	Gradient	K, cm/sec	Temp, °C	R_t	K @ 20 °C, cm/sec
03/31	1	110	105	14.5	13.2	1.3	578	29.6	6.0×10^{-8}	22	0.953	5.7×10^{-8}
	2	110	105	14.3	13.8	0.5	318	29.2	4.1×10^{-8}	22	0.953	3.9×10^{-8}
	3	110	105	14.3	13.7	0.6	441	29.2	3.6×10^{-8}	22	0.953	3.4×10^{-8}
	4	110	105	14.4	13.9	0.5	343	29.4	3.8×10^{-8}	22	0.953	3.6×10^{-8}

PERMEABILITY @ 20 °C : 3.6×10^{-8} cm/sec

Hydraulic Conductivity Using Flex Wall Permeameter by ASTM D5084 (CONSTANT VOLUME)

LAB DATA SHEET

PROJECT/SAMPLE INFO:

CLIENT: S & ME	GTX #: 1380	START DATE: 03/26/97
PROJECT: Warren County PCB Landfill	TESTED BY: swj	END DATE: 03/28/97
LOCATION: Afton, NC	CHECKED BY: gtt	SAMPLE TYPE: Undisturbed
SAMPLE #: ST-2	BORING #: B-2	DEPTH: 0-2 ft
VISUAL DESCRIPTION & PREPARATION: (clay cap material) Yellowish red clay with sand. Sample extruded from tube, cut trimmed and placed into permeameter at as received conditions.		

TEST SETUP:

SAMPLE ORIENTATION: vertical	PERMEANT FLUID: deaired tap water	CELL #: 6

SAMPLE CONDITIONS:

INITIAL		FINAL	
a) length of specimen, in	2.95	k) length of specimen, in	2.95
b) diameter of specimen, in	2.865	l) diameter of specimen, in	2.87
c) area [(b ^{2}/4) * 3.14], in ^{2}	6.45	m) area [(l ^{2}/4) * 3.14], in ^{2}	6.47
d) volume (0.7854 * a * b ^{2}), in ^{3}	19.02	n) volume (0.7854 * k * l ^{2}), in ^{3}	19.08
e) mass of specimen, g	607	o) mass of specimen, g	608
f) bulk density [(e * 3.8095)/d], pcf	121.6	p) bulk density ((o * 3.8095)/n), pcf	121.4
MOISTURE CONTENT: Tare ID	rx23	MOISTURE CONTENT: Tare ID	hl2
g) wet mass and tare, g	109.57	q) wet mass and tare, g	617
h) dry mass and tare, g	86.45	r) dry mass and tare, g	478
i) tare mass, g	9.24	s) tare mass, g	9
j) moisture content [(g-h)/(h-i)] * 100, %	29.9	t) moisture content [(q-r)/(r-s)] * 100, %	29.6
k) dry density [f/(1+(j/100))], pcf	93.6	u) dry density [p/(1+(t/100))], pcf	93.6

B COEFFICIENT DETERMINATION:

Date	Cell Pressure, psi	Pressure Increment, psi	Sample Pressure, psi	B Coefficient
03/28	110	5	105	0.95

FLOW DATA: CONSTANT VOLUME

Date	Trial #	Cell Pressure, psi	Sample Pressure, psi	Z_1	Z_2	ΔZ	Time, sec	Gradient	K, cm/sec	Temp, °C	R_t	K @ 20 °C, cm/sec
03/28	1	110	105	15.8	15.0	0.8	402	26.6	5.8×10^{-8}	22	0.953	5.5×10^{-8}
	2	110	105	16.5	16.0	0.5	290	27.8	4.8×10^{-8}	22	0.953	4.5×10^{-8}
	3	110	105	16.4	16.0	0.4	264	27.6	4.2×10^{-8}	22	0.953	4.0×10^{-8}
	4	110	105	16.9	16.3	0.6	380	28.4	4.3×10^{-8}	22	0.953	4.1×10^{-8}

PERMEABILITY @ 20 °C: 4.2×10^{-8} cm/sec

Hydraulic Conductivity Using Flex Wall Permeameter by ASTM D5084 (CONSTANT VOLUME)

LAB DATA SHEET

PROJECT/SAMPLE INFO:

CLIENT: S & ME	GTX #: 1380	START DATE: 03/26/97
PROJECT: Warren County PCB Landfill	TESTED BY: swj	END DATE: 03/28/97
LOCATION: Afton, NC	CHECKED BY: gtt	SAMPLE TYPE: Undisturbed
SAMPLE #: ST-4	BORING #: B-2	DEPTH: 2-4 ft
VISUAL DESCRIPTION & PREPARATION: (clay cap material) Yellowish red clay with sand. Sample extruded from tube, cut trimmed and placed into permeameter at as received conditions.		

TEST SETUP:

SAMPLE ORIENTATION: vertical	PERMEANT FLUID: deaired tap water	CELL #: 1

SAMPLE CONDITIONS:

INITIAL		FINAL	
a) length of specimen, in	1.65	k) length of specimen, in	1.65
b) diameter of specimen, in	2.865	l) diameter of specimen, in	2.87
c) area [(b ^{2}/4) * 3.14], in ^{2}	6.45	m) area [(l ^{2}/4) * 3.14], in ^{2}	6.47
d) volume (0.7854 * a * b ^{2}), in ^{3}	10.64	n) volume (0.7854 * k * l ^{2}), in ^{3}	10.67
e) mass of specimen, g	345	o) mass of specimen, g	347
f) bulk density [(e * 3.8095)/d], pcf	123.6	p) bulk density ((o * 3.8095)/n), pcf	123.8
MOISTURE CONTENT: Tare ID	lx4	MOISTURE CONTENT: Tare ID	cf26
g) wet mass and tare, g	117.59	q) wet mass and tare, g	356
h) dry mass and tare, g	90.88	r) dry mass and tare, g	286
i) tare mass, g	9.21	s) tare mass, g	10
j) moisture content [(g-h)/(h-i)] * 100, %	32.7	t) moisture content [(q-r)/(r-s)] * 100, %	25.4
k) dry density [f/(1+(j/100))], pcf	93.1	u) dry density [p/(1+(t/100))], pcf	98.8

B COEFFICIENT DETERMINATION:

Date	Cell Pressure, psi	Pressure Increment, psi	Sample Pressure, psi	B Coefficient
03/28	110	5	105	0.95 (assumed)

FLOW DATA: CONSTANT VOLUME

Date	Trial #	Cell Pressure, psi	Sample Pressure, psi	Z_1	Z_2	ΔZ	Time, sec	Gradient	K, cm/sec	Temp, °C	R_t	K @ 20 °C, cm/sec
03/28	1	110	105	8.2	8.0	0.2	313	24.7	2.0×10^{-8}	22	0.953	1.9×10^{-8}
	2	110	105	8.6	8.3	0.3	625	25.9	1.4×10^{-8}	22	0.953	1.3×10^{-8}
	3	110	105	9.4	9.1	0.3	567	28.3	1.4×10^{-8}	22	0.953	1.3×10^{-8}

PERMEABILITY @ 20 °C : 1.5×10^{-8} cm/sec

GeoTesting Express • Acton, Ma. • (508) 635-0424 • Fax (508) 635-0266

APPENDIX II
PVC LINER LABORATORY TESTING RESULTS

Singleton
Labs, Inc.

1413 Topside Road • Louisville, TN 37777 • (423) 970-2299 • FAX (423) 970-2312

REC'D APR 01 1997

March 25, 1997

Mr. Dan Brewer
S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

RE: PROJECT NO. 1054-97-670 - WARREN COUNTY PCB LANDFILL - LABORATORY TESTING OF 10 mil PVC LINER - SINGLETON LABS REPORT No. 1439-97-00G

Dear Mr. Brewer:

All work associated with the above referenced has been completed and is summarized in the enclosed report.

Sincerely,

Yung C. Chung, P.E.
Laboratory Director

YCC:trb
Enclosure

March 25, 1997

PREPARED FOR:
S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte , North Carolina 28273
As Requested By: D. Brewer

PROJECT NO. 1054-97-670
WARREN COUNTY PCB LANDFILL
LABORATORY TESTING OF 10 mil PVC LINER

Singleton Labs Report No. 1439-97-00G

SINGLETON LABS, INC.
1413 Topside Road
Louisville, Tennessee 37777
423-970-2299

Warren County PCB Landfill
Project No. 1054-97-670

Summary of Laboratory Test Data
10 mil PVC Liner

Test No.	Thickness (mils) ASTM D751	Density (g/cc) ASTM D792	Tear Resistance (lbs) ASTM D1004	
			MD	TD
1	9.5	1.299	4.60	3.90
2	9.8	1.318	4.50	3.88
3	9.6	1.271	4.80	4.12
4	9.5	1.324	4.20	4.44
5	9.7	1.291	4.30	4.50
6	9.7			
7	9.4			
8	9.5			
9	9.5			
10	9.7			
AVERAGES	**9.6**	**1.301**	**4.48**	**4.17**

Warren County PCB Landfill
Project No. 1054-97-670

Summary of Laboratory Test Data
10 mil PVC Liner
Tensile Properties
ASTM D882

Test No.	Break Strength (lb/in. width) MD	Break Strength (lb/in. width) TD	Tensile Strength at break (psi) MD	Tensile Strength at break (psi) TD	Elongation at break (%) MD	Elongation at break (%) TD
1	28.40	26.56	2958	2767	290	254
2	28.60	23.60	2979	2458	291	203
3	33.20	24.08	3458	2508	318	216
4	25.84	29.76	2692	3100	210	271
5	27.36	26.24	2850	2733	295	235
AVERAGES	**28.68**	**26.05**	**2987**	**2713**	**281**	**236**

Warren County PCB Landfill
Project No. 1054-97-670

Summary of Laboratory Test Data
10 mil PVC Liner
Dimensional Stability
ASTM D1204

Test Specimen	Temp (C°)	Linear Change (%) 24 Hour: Parallel to Direction of Processing	24 Hour: Perpendicular to Direction of Processing	48 Hour: Parallel to Direction of Processing	48 Hour: Perpendicular to Direction of Processing	120 Hour: Parallel to Direction of Processing	120 Hour: Perpendicular to Direction of Processing
A (Center)	100	-4.98	-1.10	-5.37	-1.10	-5.37	-1.20
B (Transverse Edge)	100	-6.43	-2.99	-6.63	-3.19	-6.73	-3.19

S&ME, Inc., CHARLOTTE, N. C.

Geosynthetic Laboratory Test Result Summary
ASTM D3083 Bonded Shear Strength, ASTM D413 Peel Adhesion

Project Name: WARREN COUNTY PCB LANDFILL
Job No.: 1054-97-670
Material Description: 10 MIL PVC
Weld Type: GLUE OVERLAP
Sample:
Tested by: SS
Date Tested: 3/21/97 Date of Summary: 3/21/97

SHEAR TESTING			
Specimen No.		Load at Yield (lbs.)	Failure Description
S1		>22.8	FTB
S2		>24.1	FTB
S3		>23.4	FTB
S4		>25.2	FTB
S5		>23.0	FTB
	Average	23.7	*FTB–Film Tear Bond
	Standard Deviation	0.9	
	Maximum	25.2	
	Minimum	22.8	

PEEL TESTING			
Specimen No.		Load at Yield(lbs)	Failure Description
P1A		5.6	100% DISBONDING
P1B			
P2A		5.6	100% DISBONDING
P2B			
P3A		5.5	100% DISBONDING
P3B			
P4A		5.6	100% DISBONDING
P4B			
P5A		4.4	100% DISBONDING
P5B			
	Average	5.3	
	Standard Deviation	0.5	
	Maximum	5.6	
	Minimum	4.4	

*FTB–Film Tear Bond

Filename: 97670PVC

REPORT OF
AQUIFER TESTS ON
RECOVERY WELL B-1
WARREN COUNTY PCB LANDFILL
WARREN COUNTY, NORTH CAROLINA

Prepared for:

North Carolina Department of Environment,
Health, and Natural Resources
Division of Waste Management
Raleigh, NC 27611-7687

S&ME Project No. 1054-97-670

Prepared by:

S&ME, Inc.
3100 Spring Forest Road
Raleigh, NC 27604

Walter J. Beckwith, P.G.
Senior Project Geologist

Ann M. Borden, P.G., Vice President
Environmental Manager

April 22, 1997

TABLE OF CONTENTS

1.0 INTRODUCTION

Two borings were drilled in the Warren County PCB Landfill to obtain samples of landfill materials for bench scale detoxification studies. At the completion of drilling, the borings were converted to recovery wells. The recovery wells can be used in the future to remove water that is present in the landfilled materials. Slug tests were performed in one of the recovery wells to evaluate the hydraulic conductivity of the saturated landfill materials.

2.0 SOIL BORINGS AND WELL INSTALLATION

Two borings were opened in the landfill in accordance with the Work Plan submitted by S&ME on February 13, 1997. The borings were opened with 3-1/4 inch ID hollow stem augers. Split-spoon samples and thin wall (Shelby) tube samples were obtained during drilling to evaluate the landfill cap soils and the PCB-impacted soil buried in the landfill.

The cap soils were visually classified in the field as silty clay, denoted by (CH) in the Unified Soil Classification System. Most of the landfilled soils were classified in the field as silty sand (SM) containing some clay and organic material. Boring B-1 was extended approximately 30 feet below grade. B-2 was extended approximately 31 feet below grade. Both borings were drilled completely through the landfilled soils, terminating at the top of the five-feet of compacted clay that is present beneath the landfill.

The 3-1/4 inch augers were removed and the boreholes were reamed with 8-1/4 inch ID hollow stem augers that opened a 12-1/2 inch borehole. The smaller augers were used to facilitate collection of geotechnical soil samples and the larger augers were required to install the wells. The larger augers were advanced to the same termination depths.

The borings were converted to wells with the installation of 6-inch diameter wire wrapped PVC screen attached to Schedule 40 PVC well casing. The screen sections were attached to the PVC casing using flush-threaded ends. Twenty feet of screen were installed at each of the wells. The annular space between the outside of the screen and the borehole was filled with fine filter sand. The sand was extended to approximately one foot above the top of the screen. The remaining annular space above the screen was filled with bentonite pellets.

3.0 AQUIFER TEST

Approximately 17 days after installation of recovery well B-1, the well was tested to determine the relative hydraulic conductivity of the saturated landfill soils. The test, commonly referred to as a "slug test", was performed by inserting a slug of known volume into the well. The well was monitored as the water level returned to static conditions using a pressure transducer. The slug was constructed from an 8-foot length of 4-inch PVC pipe. The slug was sealed at both ends and weighted so that it would sink, displacing an equivalent volume of water in the well.

The cap securing the top of the well was removed prior to testing and the well was allowed to vent to the atmosphere for approximately one hour before the test was started. This was to better assure that the initial test readings were indicative of static conditions. The depth to the water table was measured from the top of the well casing using an electronic water level indicator. A pressure transducer was installed in the well and attached to a computer and data logger. The slug was suspended over the well using a tripod with hand winch. The computer was programmed to begin recording pressure readings and the PVC slug was lowered to bottom of the well using the hand winch. Water level readings were obtained every two seconds for approximately 87 minutes. After this period of time the water level in the well was approximately 1.1 feet above static level.

After recording the final value with the water level indicator, the test was terminated and the data logger was initiated for a second test. The slug was winched out of the well and the corresponding drop in water level was monitored by the data logger. Monitoring both insertion and removal of the slug allowed calculations of hydraulic conductivity to be performed for each condition. Manual measurements of water level with the water level indicator were used to confirm the data logger values. After terminating the second test, the slug and transducer were removed from the well, decontaminated, and removed from the site.

4.0 DATA EVALUATION

Because the sandpack for B-1 is not completely submerged, i.e the water table falls within the screened interval of the well, a rise in water level initially saturates the sandpack during a "slug in" test. Because the filter pack is often more permeable than the formation materials, the initial values of the test can yield higher conductivity values. Performance and analysis of a "slug out" test is usually recommended for wells with partially submerged screen lengths. Analysis of the two tests from a single well provides a comparison between the conductivity values calculated from each test.

The time and water level data (included in Appendix I) were downloaded from the data logger into an Excel™ spread sheet program for numerical processing. Two files were created, the first consisting of the data for the "slug in" test and the second set of data for the "slug out" test. Both files contained the transducer values of depth of water overlying the transducer (the transducer reads pressure or feet of water). Figure 1 in Appendix I shows the depth of water over the transducer data for both tests. This data was converted to equivalent measurement of "depth to the water level from the top of the well casing" by using the initial value for the depth to water obtained with the water level indicator. Figure 2 in Appendix I shows the depth to water data for both tests measured from the top of casing.

The depth to water vs. time data was imported into a series of Excel™ worksheets, the Aquifer Test Toolbox (ATT) Version 2.0, designed by Creative Scientific Applications. The ATT workbooks let the user modify and analyze data from aquifer tests. The data entry forms and corresponding calculations of hydraulic conductivity along with displacement vs. time graphs are included in Appendix I. The slug test data entry form allows entry of a variety of units of measurement. Feet and minutes (data type 2) were selected for both tests. The well was considered to be unconfined. The static water level (19.36 feet) was measured from the top of the casing. The initial reading after insertion of the slug was 16.50 feet. The well was 30.5 feet deep. The intake soil column was calculated from the borehole diameter, the screen diameter, and an assumed porosity value of 30 % for the sandpack. The thickness of the aquifer was calculated to be 11.14 feet. This is the saturated thickness of the landfill at the B-1 location.

The data were evaluated by the Hvorslev and Bouwer and Rice analytical methods. Typically, the Hvorslev Method is used for confined aquifers where the screen is fully submerged. When used for unconfined conditions, the method tends to over-estimate hydraulic conductivity. It is useful in this application as a check of the Bouwer and Rice method results. The Hvorslev Method has an additional entry for the type or shape factor (well point geometry). The data were evaluated using test type number 6 which applies to a well point screen set at an impervious boundary. The output of the test was specified in centimeters and seconds (7). The Bouwer and Rice Method used the same input data with an additional value for the saturated aquifer thickness. Output was also specified in centimeters and minutes.

5.0 RESULTS OF THE ANALYSES

Evaluation of the data suggests the saturated landfill soils have a hydraulic conductivity on the order of 1 x10^{-5} centimeters per second. The following table shows the hydraulic conductivity values calculated for the slug in and slug out tests by each analytical method.

Table 1

Calculated Hydraulic Conductivity for Saturated Soil at Well B-1

TEST METHODS	SLUG IN TEST	SLUG OUT TEST
Hvorslev Method	4.80×10^{-5} cm/sec	1.39×10^{-4} cm/sec
Bouwer and Rice Method	2.35×10^{-5} cm/sec	6.02×10^{-5} cm/sec

Saturated hydraulic conductivity was determined on four samples of saturated landfill soils obtained from B-1 and B-2. Results of the laboratory tests are shown below for comparison with the field tests.

Table 2

Laboratory Hydraulic Conductivity of Saturated Soils From B-1 and B-2

BORING	SAMPLE NO.	DEPTH (BGS)	HYDRAULIC CONDUCTIVITY
B-1	ST-15	20.5' - 22.5'	5.2×10^{-4} cm/sec
B-1	ST-16	22.5' - 24.5'	2.9×10^{-3} cm/sec
B-2	ST-15	20.5' - 22.5'	8.3×10^{-4} cm/sec
B-2	ST-16	22.5' - 24.5'	4.8×10^{-4} cm/sec

BGS = Below Ground Surface

6.0 CONCLUSIONS

The field test data suggest that the saturated soil at the landfill have saturated hydraulic conductivity value of approximately 1×10^{-5} cm/sec. These values are lower than hydraulic conductivity values for the landfill soils determined in the laboratory by approximately one order of magnitude. The field measurements tend to support field observations made during drilling of the borings. Both borings were advanced to the termination depth without free water accumulating in the augers. Split-spoon samples collected as the boring was advanced also showed no free water. The split-spoon sampler showed some moisture or dampness where soil was in contact with the inside surface of the sampler after removal of the sample. Only after the borings penetrated the drainage medium did free water accumulate in the augers. Soils typically associated with conductivity values of 1×10^{-4} cm/sec are fine silty sands typical of Coastal Plain soils.

These soils, when saturated, drain freely. The laboratory tests were performed by trimming the tubes and permeating the soil while still in the tube. Slight leakage between the edge of the soil and the inside of the tube could result in slightly higher conductivity values.

The wells were not developed prior to testing as well development was outside the project work scope and it was felt that since the well intersected the drainage medium, that further development would "develop" the connection between the drainage blanket and the well filter pack, possibly masking the lower permeability of the landfill materials. It is possible that with continued development, conductivity values would be in the range of 1×10^{-4} cm/sec.

REFERENCES:

Bouwer , H.,1989, The Bouwer and Rice Slug Test - An update: Groundwater, Volume 27, Number 3, pp 304-309.

Creative Scientific Applications, 1995, The Aquifer Test Toolbox (For Microsoft Excel™ Version 5) Release Version 2.0, P.O. Box 92, Wellsville, PA 17365

GeoTesting Express, April 3, 1997, Geotechnical Test Results, Warren County PCB Landfill, Afton N.C., prepared for S&ME, Inc.

S&ME, Inc., February 13, 1997, Work Plan for the Excavation Handling and Storage of PCB Contaminated Soils from the Warren County PCB Landfill, Warren County, North Carolina, submitted to the North Carolina Department Of Environment Health and Natural Resources, Division of Waste Management, Raleigh N.C.

FIGURE 1

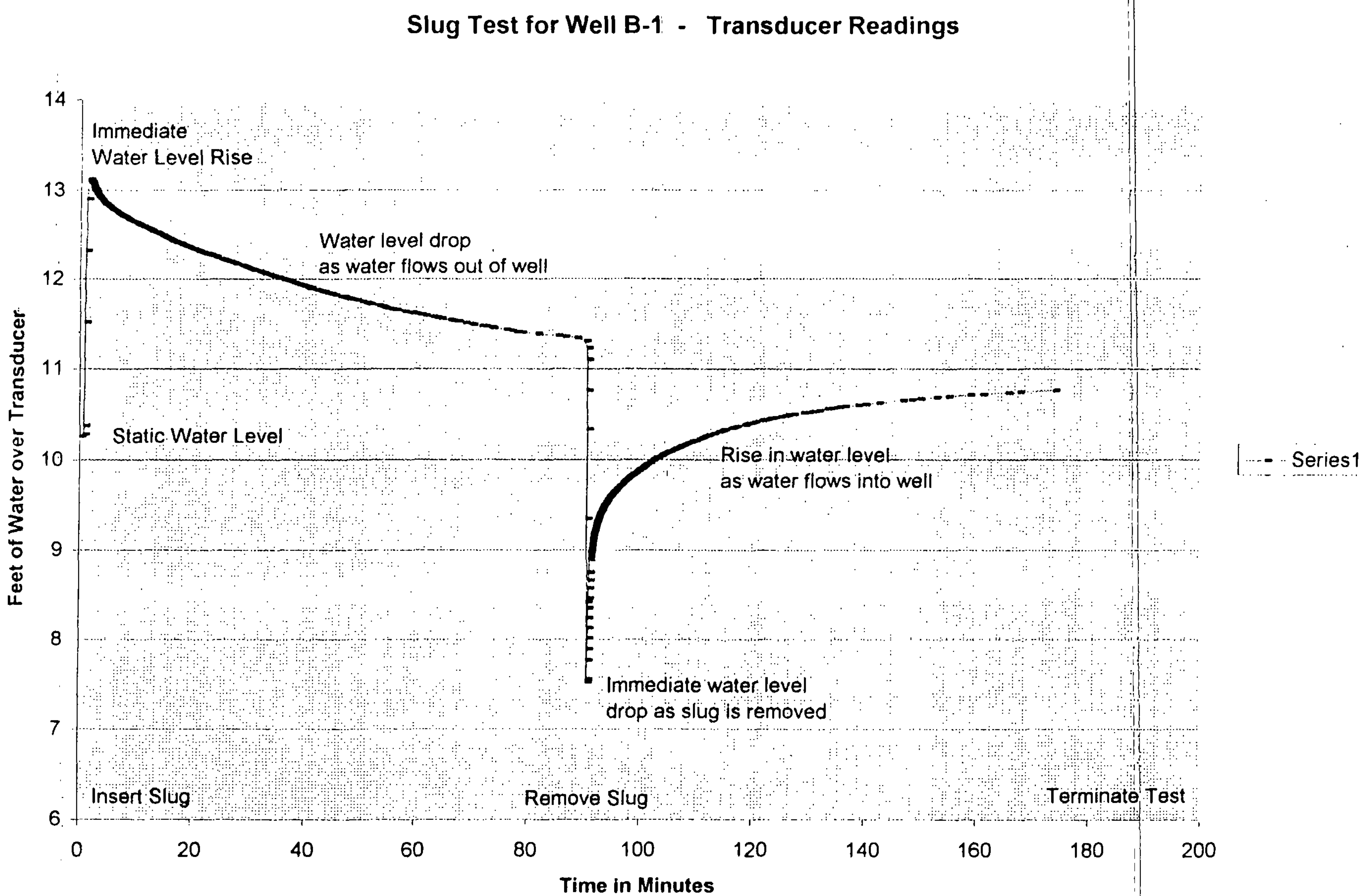
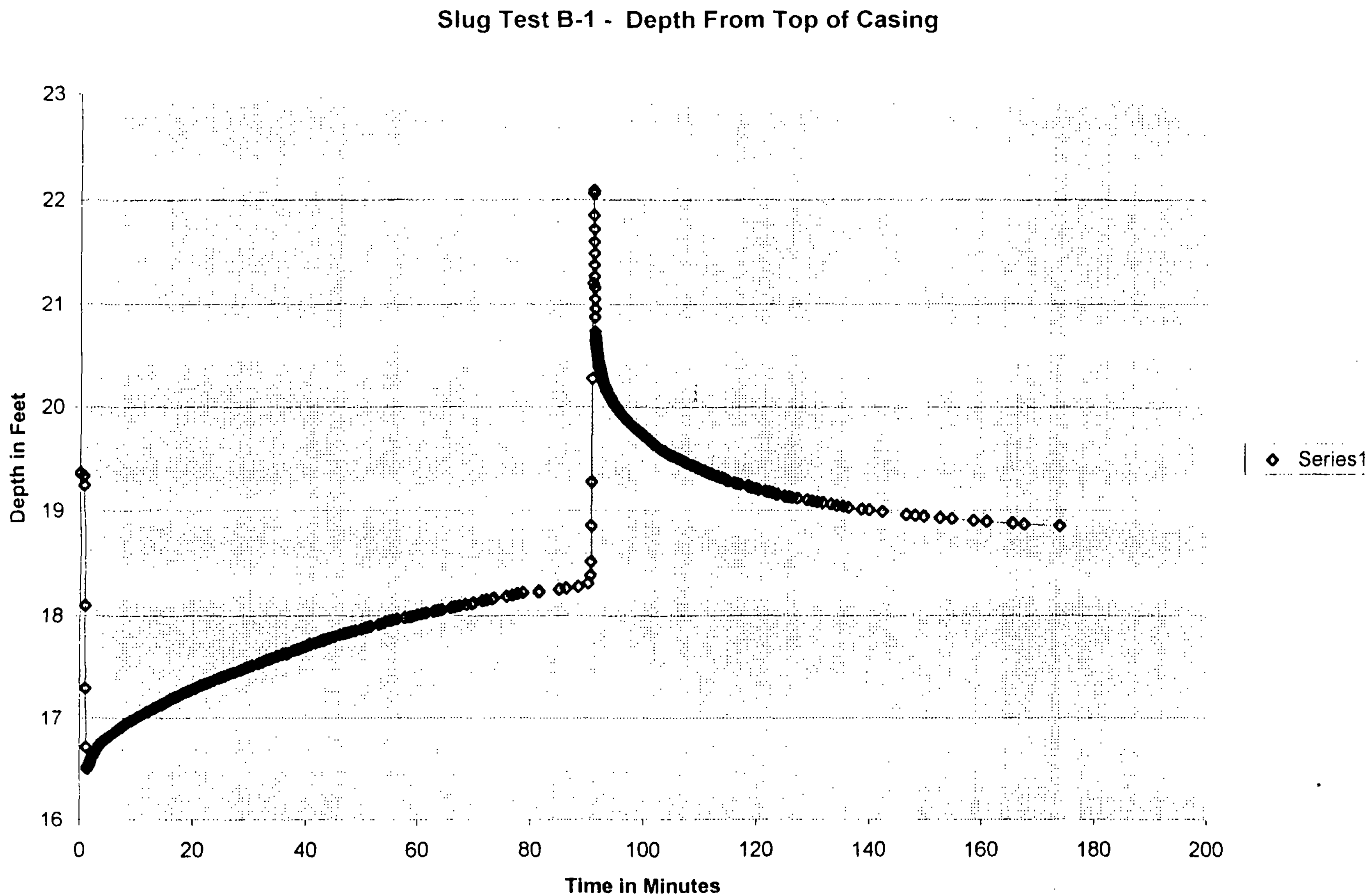

Slug Test for Well B-1 - Transducer Readings
14
13
12
11
10
9
8
7
6
0
20
40
60
80
100
120
140
160
180
200
Feet of Water over Transducer
Time in Minutes
Immediate
Water Level Rise
Water level drop
as water flows out of well
Static Water Level
Rise in water level
as water flows into well
Immediate water level
drop as slug is removed
Insert Slug
Remove Slug
Terminate Test
Series1

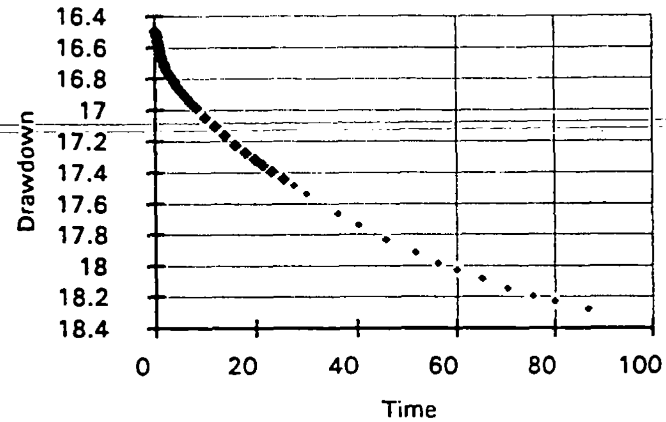
FIGURE 2


Slug Test B-1 - Depth From Top of Casing
23
22
21
20
19
18
17
16
Depth in Feet
0
20
40
60
80
100
120
140
160
180
200
Time in Minutes
Series1

SLUG TEST DATA ENTRY FORM

Client Name: N.C. Div.of Waste Mgmt. Well Number: B-1 Test Type: Slug In
Project No.: 1054-97-670 Topo. Elev.: N/A Weather: Sunny/warm
Project Name: Warren Co. PCB Landfill Analysis By: WJB Date Started: 3/7/97

BASIC TEST DATA	
Measurement Units (1-6):	2
Unconfined(1)/Confined(2):	1
Well Depth - TOC (feet):	30.5
Static W/L-Depth (ft.):	19.36
Riser Pipe Diameter (feet):	0.5
Initial Test Depth Value (ft.):	16.35
TOC Elevation (feet):	NA
Intake/Soil Col. Diam. (feet):	0.689
Depth to Top of Pack (feet):	10.5
Intake/Soil Col. Length (ft.):	20
Saturat. Col. Thickness (ft.):	11.14
Casing Soil Length (if appl.):	8.5
Casing Stickup (feet):	1.5
Slug Volume (ft^3):	0.9
Thickness of Aquifer (feet):	11.14



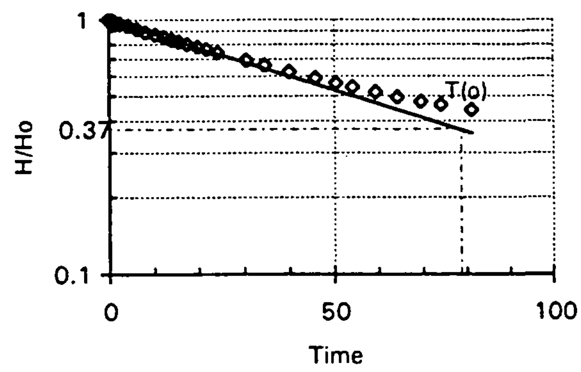
AQUIFER RECOVERY DATA

Time (min)	Depth (ft.)	Time (min)	Depth (ft.)	Time (min)	Depth (ft.)	Time (min)	Depth (ft.)
0.04	16.4955	4.37	16.842	65.14	18.084		
0.1	16.504	4.57	16.8505	70.04	18.143		
0.27	16.521	4.77	16.859	75.34	18.194		
0.34	16.529	5.17	16.8755	80	18.2275		
0.37	16.5375	5.34	16.884	86.94	18.278		
0.5	16.5545	5.77	16.901				
0.57	16.563	6	16.9095				
0.67	16.58	6.27	16.918				
0.74	16.597	6.67	16.935				
0.87	16.6135	6.87	16.9435				
0.94	16.622	7.04	16.9515				
1.04	16.6305	8.24	16.9855				
1.17	16.6475	10.04	17.0445				
1.2	16.656	12.04	17.104				
1.47	16.673	13.94	17.163				
1.57	16.6815	16.17	17.222				
1.64	16.69	18.14	17.273				
1.87	16.7065	19.84	17.315				
1.97	16.715	21.4	17.349				
2.1	16.7235	23.24	17.391				
2.3	16.7405	25.57	17.442				
2.47	16.749	27.6	17.484				
2.54	16.7575	30.07	17.5345				
2.94	16.7745	36.37	17.6615				
3.14	16.7825	40.3	17.7375				
3.27	16.791	45.87	17.8305				
3.67	16.808	51.7	17.915				
3.8	16.8165	56.27	17.9825				
4	16.825	60.04	18.025				

Hvorslev's Method for Calculating Hydraulic Conductivity

Project Name:	Warren Co. PCB Landfill	Project No.:	1054-97-670
Client Name:	N.C. Div.of Waste Mgmt.	Run Date:	3/7/97
Analysis By:	WJB	Identification:	B-1

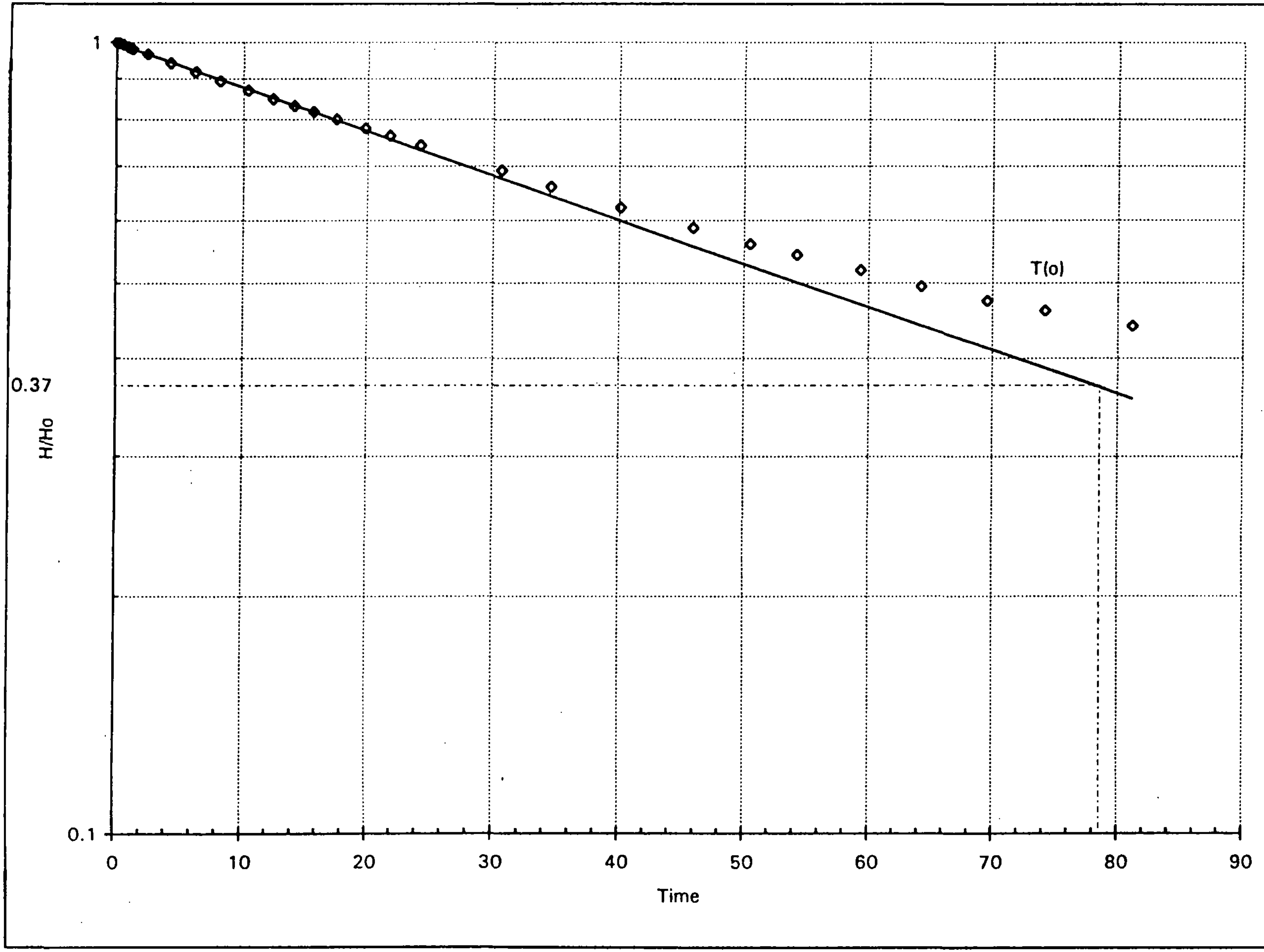
Test Type:	6	1 to 7
Riser Pipe Diameter:	0.5	feet
Intake Diam.:	0.689	feet
Intake Length:	20	feet
Water Table Depth:	19.36	feet
Line Fit Starting No.:	35	Min 1 to
Line Fit Ending No.:	50	Max 63
Entrapped Air Correct.:	N	Y or N
Specify Output Units:	7	1 to 9
Hyd Cond, K(h):	4.80E-05	cm./sec.
Basic Time Lag:	78.58	min.
Error of Fit:	0.0002	



Meas. No.	Time minutes	Field Meas. feet	Drawdown/up feet	Line Fit To LN(Hi/H-HO)	Regression To LN(Hi/H-HO)
1)	0.04	16.50	2.86	0.1526	0.0689
2)	0.10	16.50	2.86	0.1497	0.0682
3)	0.27	16.52	2.84	0.1437	0.0660
4)	0.34	16.53	2.83	0.1409	0.0651
5)	0.37	16.54	2.82	0.1379	0.0648
6)	0.50	16.55	2.81	0.1318	0.0631
7)	0.57	16.56	2.80	0.1288	0.0622
8)	0.67	16.58	2.78	0.1227	0.0609
9)	0.74	16.60	2.76	0.1166	0.0601
10)	0.87	16.61	2.75	0.1106	0.0584
11)	0.94	16.62	2.74	0.1075	0.0575
12)	1.04	16.63	2.73	0.1044	0.0563
13)	1.17	16.65	2.71	0.0981	0.0546
14)	1.20	16.66	2.70	0.0950	0.0542
15)	1.47	16.67	2.69	0.0887	0.0508
16)	1.57	16.68	2.68	0.0855	0.0495
17)	1.64	16.69	2.67	0.0823	0.0486
18)	1.87	16.71	2.65	0.0761	0.0457
19)	1.97	16.72	2.65	0.0729	0.0445
20)	2.10	16.72	2.64	0.0697	0.0428
21)	2.30	16.74	2.62	0.0632	0.0403
22)	2.47	16.75	2.61	0.0600	0.0381
23)	2.54	16.76	2.60	0.0567	0.0372
24)	2.94	16.77	2.59	0.0502	0.0322
25)	3.14	16.78	2.58	0.0471	0.0296
26)	3.27	16.79	2.57	0.0438	0.0280

27)	3.67	16.81	2.55	0.0371	0.0229
28)	3.80	16.82	2.54	0.0338	0.0213
29)	4.00	16.83	2.54	0.0304	0.0187
30)	4.37	16.84	2.52	0.0237	0.0140
31)	4.57	16.85	2.51	0.0203	0.0115
32)	4.77	16.86	2.50	0.0169	0.0090
33)	5.17	16.88	2.48	0.0103	0.0039
34)	5.34	16.88	2.48	0.0069	0.0017
35)	5.77	16.90	2.46	0.0000	-0.0037
36)	6.00	16.91	2.45	-0.0035	-0.0066
37)	6.27	16.92	2.44	-0.0069	-0.0101
38)	6.67	16.94	2.43	-0.0139	-0.0151
39)	6.87	16.94	2.42	-0.0174	-0.0177
40)	7.04	16.95	2.41	-0.0208	-0.0198
41)	8.24	16.99	2.37	-0.0350	-0.0350
42)	10.04	17.04	2.32	-0.0601	-0.0579
43)	12.04	17.10	2.26	-0.0862	-0.0832
44)	13.94	17.16	2.20	-0.1127	-0.1073
45)	16.17	17.22	2.14	-0.1399	-0.1356
46)	18.14	17.27	2.09	-0.1640	-0.1606
47)	19.84	17.32	2.05	-0.1844	-0.1821
48)	21.40	17.35	2.01	-0.2011	-0.2019
49)	23.24	17.39	1.97	-0.2222	-0.2252
50)	25.57	17.44	1.92	-0.2485	-0.2548
51)	27.60	17.48	1.88	-0.2706	-0.2805
52)	30.07	17.53	1.83	-0.2979	-0.3118
53)	36.37	17.66	1.70	-0.3700	-0.3917
54)	40.30	17.74	1.62	-0.4158	-0.4415
55)	45.87	17.83	1.53	-0.4748	-0.5121
56)	51.70	17.92	1.45	-0.5316	-0.5861
57)	56.27	17.98	1.38	-0.5795	-0.6440
58)	60.04	18.03	1.34	-0.6108	-0.6918
59)	65.14	18.08	1.28	-0.6560	-0.7565
60)	70.04	18.14	1.22	-0.7034	-0.8186
61)	75.34	18.19	1.17	-0.7462	-0.8858
62)	80.00	18.23	1.13	-0.7753	-0.9449
63)	86.94	18.28	1.08	-0.8209	-1.0329

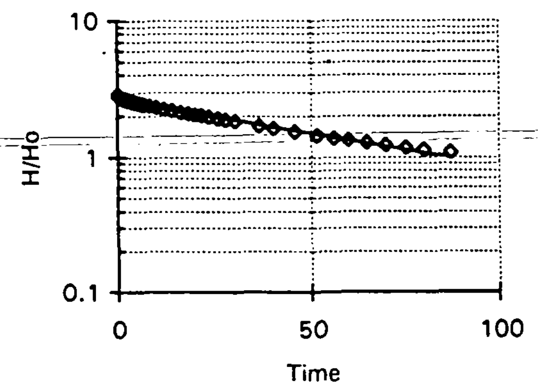
Hvorslev MainChart



Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Warren Co. PCB Landfill Project No.: 1054-97-670
Client Name: N.C. Div.of Waste Mgmt. Identification: B-1
Analysis By: WJB
Run Date:

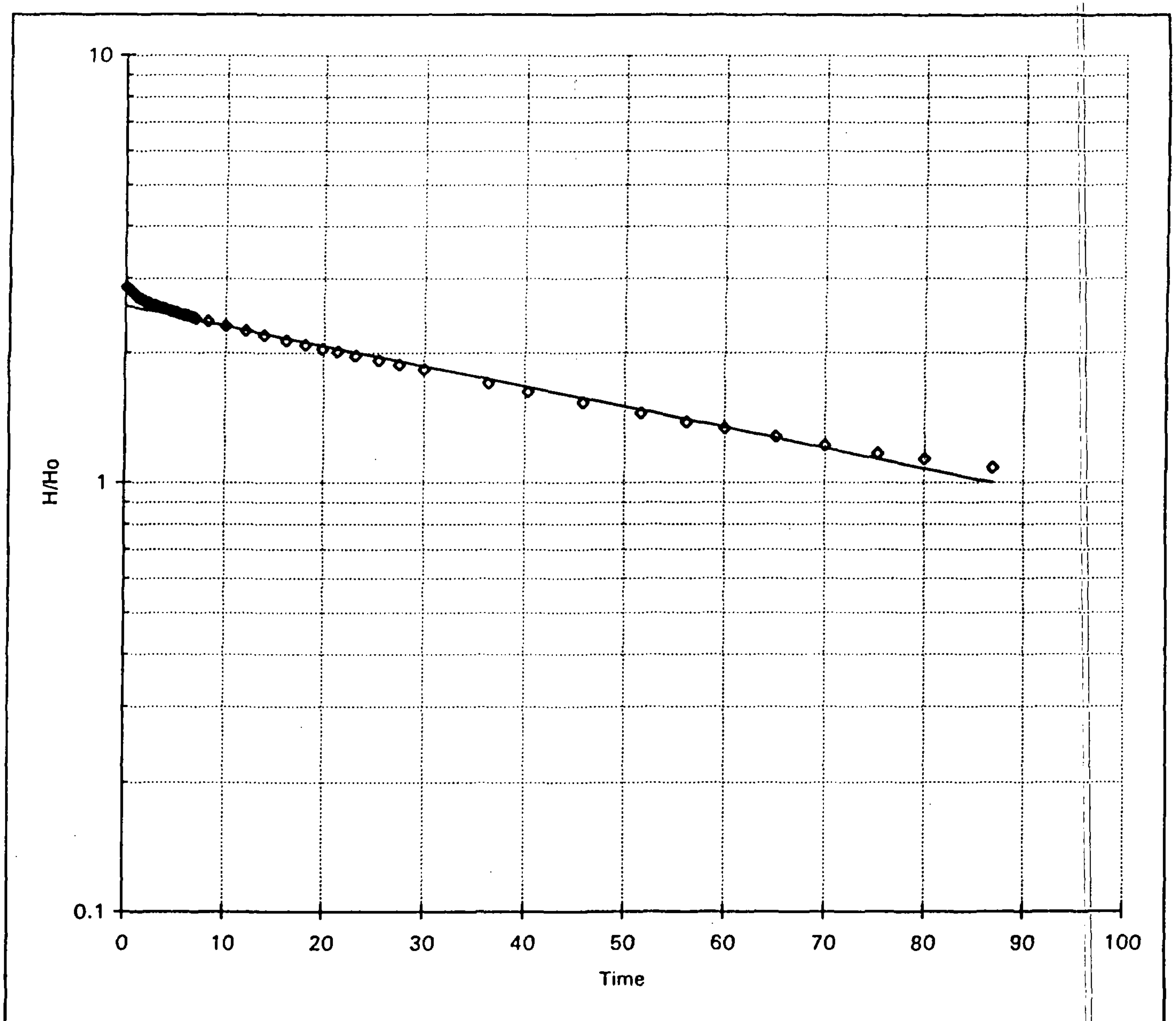
Riser Pipe Diameter:	0.5	feet
Intake Diameter:	0.698	feet
Intake Length:	20	feet
Saturated Column Length:	11.14	feet
Water Table Depth:	19.36	feet
Aquifer Thickness:	11.14	feet
Line Fit Starting No.:	30	Min 1 to
Line Fit Ending No.:	62	Max 63
Specify Output Units:	7	1 to 9
Hyd. Cond., K(h):	2.35E-05	cm./sec.
Error of Fit:	0.011	



Meas. #	Time minutes	Field Meas. feet	Drawdown/up feet		Line Fit To LN(Yt)	Regression On LN(Yt)
1)	0.04	16.50	2.86		1.052	0.949
2)	0.10	16.50	2.86		1.049	0.948
3)	0.27	16.52	2.84		1.043	0.946
4)	0.34	16.53	2.83		1.041	0.946
5)	0.37	16.54	2.82		1.038	0.945
6)	0.50	16.55	2.81		1.032	0.944
7)	0.57	16.56	2.80		1.029	0.943
8)	0.67	16.58	2.78		1.022	0.942
9)	0.74	16.60	2.76		1.016	0.941
10)	0.87	16.61	2.75		1.010	0.940
11)	0.94	16.62	2.74		1.007	0.939
12)	1.04	16.63	2.73		1.004	0.938
13)	1.17	16.65	2.71		0.998	0.937
14)	1.20	16.66	2.70		0.995	0.936
15)	1.47	16.67	2.69		0.988	0.933
16)	1.57	16.68	2.68		0.985	0.932
17)	1.64	16.69	2.67		0.982	0.932
18)	1.87	16.71	2.65		0.976	0.929
19)	1.97	16.72	2.65		0.973	0.928
20)	2.10	16.72	2.64		0.969	0.926
21)	2.30	16.74	2.62		0.963	0.924
22)	2.47	16.75	2.61		0.960	0.922
23)	2.54	16.76	2.60		0.956	0.922
24)	2.94	16.77	2.59		0.950	0.917
25)	3.14	16.78	2.58		0.947	0.915

26)	3.27	16.79	2.57		0.944	0.914
27)	3.67	16.81	2.55		0.937	0.909
28)	3.80	16.82	2.54		0.934	0.908
29)	4.00	16.83	2.54		0.930	0.906
30)	4.37	16.84	2.52		0.923	0.902
31)	4.57	16.85	2.51		0.920	0.899
32)	4.77	16.86	2.50		0.917	0.897
33)	5.17	16.88	2.48		0.910	0.893
34)	5.34	16.88	2.48		0.907	0.891
35)	5.77	16.90	2.46		0.900	0.886
36)	6.00	16.91	2.45		0.896	0.884
37)	6.27	16.92	2.44		0.893	0.881
38)	6.67	16.94	2.43		0.886	0.877
39)	6.87	16.94	2.42		0.882	0.874
40)	7.04	16.95	2.41		0.879	0.872
41)	8.24	16.99	2.37		0.865	0.859
42)	10.04	17.04	2.32		0.840	0.840
43)	12.04	17.10	2.26		0.814	0.818
44)	13.94	17.16	2.20		0.787	0.797
45)	16.17	17.22	2.14		0.760	0.773
46)	18.14	17.27	2.09		0.736	0.751
47)	19.84	17.32	2.05		0.715	0.733
48)	21.40	17.35	2.01		0.699	0.716
49)	23.24	17.39	1.97		0.678	0.695
50)	25.57	17.44	1.92		0.651	0.670
51)	27.60	17.48	1.88		0.629	0.648
52)	30.07	17.53	1.83		0.602	0.621
53)	36.37	17.66	1.70		0.530	0.552
54)	40.30	17.74	1.62		0.484	0.509
55)	45.87	17.83	1.53		0.425	0.448
56)	51.70	17.92	1.45		0.368	0.384
57)	56.27	17.98	1.38		0.320	0.335
58)	60.04	18.03	1.34		0.289	0.293
59)	65.14	18.08	1.28		0.244	0.238
60)	70.04	18.14	1.22		0.196	0.184
61)	75.34	18.19	1.17		0.154	0.126
62)	80.00	18.23	1.13		0.124	0.075
63)	86.94	18.28	1.08		0.079	-0.001

Bouwer & Rice MainChart



Calculator for Finding Effective Well Radius (r_c)

This worksheet calculates the effective radius of the well casing/bore over which water level changes occur during the test. Effective radius should be used if the water level during the test is within the screened length of the well, and the hydraulic conductivity (K) of the pack material or the zone of development is significantly greater than the aquifer conductivity. Otherwise the radius of the well casing/bore or the open hole radius should be used. Use the calculated effective radius as the input (multiplied by 2 for diameter) for the Intake/Soil Column Diameter entry found on the Data Entry sheet.

Data Entry (Use any consistent units for input.)

Actual inside screen radius (r_i):	2.500E-01
Radius of well bore or pack (r_o):	5.000E-01
Porosity of pack material or the developed zone (n):	3.000E-01

Calculated Result

Effective radius (r_c):	3.446E-01
Effective diameter:	6.892E-01

Warren County PCB Landfill
Field Data For
"Slug In" Test in Well B-1

S/N SDEE-03A-SN-3521 Block 1

Program: INTERVAL
Readings: 2714
Start Time: 13:04:39
Start Date: 03/07
Range: 0015 PSI
Channels: 1
Units: Ft-H2O

Interval: 00:00:02

Time	Chnl 1	Time	Chnl 1
0.00	10.26	2.90	12.94
0.60	10.28	2.97	12.93
0.77	10.38	3.07	12.92
0.90	11.52	3.20	12.91
1.03	12.32	3.30	12.90
1.17	12.90	3.43	12.89
1.30	13.10	3.53	12.89
1.33	13.11	3.63	12.88
1.37	13.12	3.80	12.87
1.43	13.11	3.87	12.86
1.53	13.10	3.97	12.85
1.60	13.10	4.03	12.84
1.67	13.09	4.23	12.85
1.70	13.08	4.27	12.84
1.77	13.07	4.47	12.83
1.83	13.06	4.60	12.83
1.90	13.05	4.73	12.82
1.93	13.05	5.00	12.81
2.00	13.04	5.13	12.80
2.07	13.02	5.33	12.79
2.17	13.01	5.50	12.78
2.20	13.00	5.70	12.78
2.23	13.01	5.90	12.77
2.27	13.00	6.10	12.76
2.30	13.00	6.30	12.75
2.33	13.00	6.50	12.74
2.37	12.99	6.67	12.73
2.47	12.98	6.83	12.72
2.50	12.97	7.10	12.72
2.53	12.96	7.33	12.71
2.57	12.97	7.37	12.71
2.63	12.96	7.60	12.70
2.80	12.94	7.80	12.69

Time	Chnl 1	Time	Chnl 1
8.00	12.68	21.17	12.30
8.20	12.67	21.53	12.29
8.37	12.67	21.90	12.29
8.93	12.65	22.30	12.28
9.17	12.64	22.73	12.27
9.57	12.63	23.03	12.26
9.83	12.62	23.60	12.25
10.03	12.61	23.80	12.24
10.30	12.61	24.57	12.23
10.80	12.59	24.97	12.22
11.10	12.58	25.23	12.21
11.37	12.57	25.67	12.20
11.63	12.56	26.20	12.19
12.00	12.56	26.50	12.18
12.27	12.55	26.90	12.18
12.43	12.54	27.30	12.17
12.80	12.53	28.17	12.15
13.07	12.52	28.53	12.14
13.37	12.51	28.93	12.13
13.70	12.51	29.30	12.12
14.03	12.50	29.67	12.12
14.33	12.49	30.13	12.11
14.60	12.48	30.43	12.10
14.77	12.47	31.40	12.08
15.03	12.46	31.80	12.07
15.27	12.45	32.23	12.07
15.60	12.45	32.63	12.06
15.87	12.44	33.17	12.05
16.07	12.43	33.53	12.04
16.50	12.42	34.00	12.03
16.80	12.41	34.73	12.01
17.13	12.40	34.93	12.01
17.50	12.40	35.70	12.00
17.77	12.39	35.93	11.99
18.10	12.38	36.40	11.98
18.47	12.37	36.43	11.99
18.83	12.36	36.47	11.99
19.13	12.35	36.50	11.98
19.47	12.34	37.10	11.97
19.77	12.34	37.70	11.96
20.13	12.33	38.07	11.95
20.50	12.32	38.63	11.94
20.80	12.31	39.17	11.93

Warren County PCB Landfill
Field Data For
"Slug In" Test in Well B-1

S/N SDEE-03A-SN-3521 Block 1

Program: INTERVAL
Readings: 2714
Start Time: 13:04:39
Start Date: 03/07
Range: 0015 PSI
Channels: 1
Units: Ft-H2O

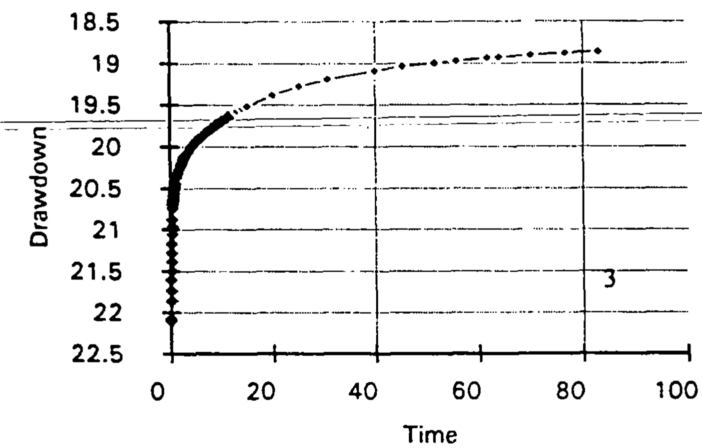
Interval: 00:00:02

Time	Chnl 1	Time	Chnl 1
39.60	11.92	58.60	11.63
40.03	11.91	59.13	11.62
40.27	11.91	59.80	11.61
40.43	11.90	60.60	11.60
40.70	11.89	61.37	11.59
40.73	11.90	62.77	11.58
41.63	11.88	63.47	11.57
42.13	11.87	64.17	11.56
42.63	11.86	65.80	11.54
43.07	11.86	66.47	11.53
43.13	11.85	67.27	11.52
43.60	11.85	68.43	11.51
44.07	11.84	69.43	11.50
44.47	11.83	69.80	11.49
45.00	11.82	71.37	11.47
46.03	11.80	72.13	11.47
46.77	11.80	73.10	11.46
47.20	11.79	73.33	11.45
47.60	11.78	75.63	11.43
48.13	11.77	76.67	11.42
48.87	11.76	77.57	11.41
49.97	11.74	78.50	11.40
50.63	11.74	81.33	11.39
51.10	11.73	81.37	11.38
51.57	11.72	84.90	11.36
53.03	11.70	86.13	11.36
53.53	11.69	88.27	11.34
53.90	11.69		
54.13	11.68		
54.93	11.67		
55.43	11.66		
56.20	11.65		
57.60	11.63		

SLUG TEST DATA ENTRY FORM

Client Name: N.C. Div.of Waste Mgmt. Well Number: B-1 Test Type: Slug out
Project No.: 1054-97-670 Topo. Elev.: N/A Weather: Sunny/warm
Project Name: Warren Co. PCB Landfill Analysis By: WJB Date Started: 3/7/97

BASIC TEST DATA	
Measurement Units (1-6):	2
Unconfined(1)/Confined(2):	1
Well Depth - TOC (feet):	30.5
Static W/L-Depth (ft.):	18.32
Riser Pipe Diameter (feet):	0.5
Initial Test Depth Value (ft.):	21.51
TOC Elevation (feet):	N/A
Intake/Soil Col. Diam. (feet):	0.689
Depth to Top of Pack (feet):	10.5
Intake/Soil Col. Length (ft.):	20
Saturat. Col. Thickness (ft.):	11.14
Casing Soil Length (if appl.):	8.5
Casing Stickup (feet):	1.5
Slug Volume (ft^3):	0.9
Thickness of Aquifer (feet):	11.14



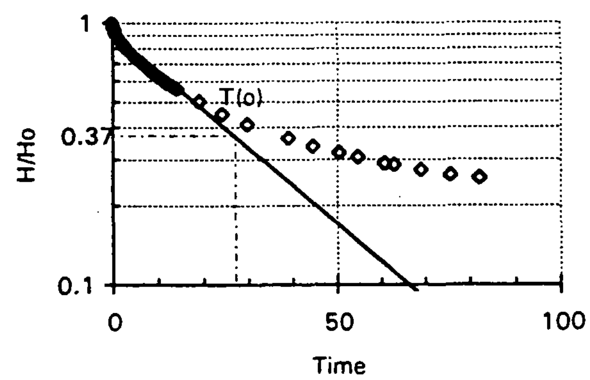
AQUIFER RECOVERY DATA

Time (min)	Depth (ft.)	Time (min)	Depth (ft.)	Time (min)	Depth (ft.)	Time (min)	Depth (ft.)
0.03	22.096	1	20.44	51.5	18.995		
0.06	22.0705	1.26	20.372	55.76	18.9695		
0.1	21.8595	1.5	20.3215	61.73	18.936		
0.13	21.7325	1.76	20.271	63.9	18.9275		
0.16	21.606	2.03	20.2285	70.03	18.902		
0.2	21.496	2.26	20.195	76.7	18.8765		
0.23	21.386	2.53	20.161	83.03	18.86		
0.26	21.2765	2.73	20.1355				
0.3	21.1665	3	20.1105				
0.33	21.0565	3.5	20.0595				
0.36	20.9635	4.03	20.0175				
0.4	20.879	4.46	19.9835				
0.43	20.7355	4.96	19.95				
0.46	20.6425	5.53	19.916				
0.5	20.6935	5.96	19.8905				
0.53	20.685	6.96	19.8315				
0.56	20.6595	8	19.781				
0.6	20.634	9.06	19.73				
0.63	20.609	10.03	19.688				
0.66	20.592	11	19.6455				
0.7	20.5665	12.03	19.6035				
0.73	20.558	13	19.5695				
0.76	20.533	14.1	19.5355				
0.8	20.516	15.03	19.5105				
0.83	20.5075	20	19.3835				
0.86	20.4905	25.23	19.274				
0.9	20.4735	30.8	19.1895				
0.93	20.465	40	19.088				
0.96	20.4485	45.46	19.037				

Hvorslev's Method for Calculating Hydraulic Conductivity

Project Name:	Warren Co. PCB Landfill	Project No.:	1054-97-670
Client Name:	N.C. Div.of Waste Mgmt.	Run Date:	3/7/97
Analysis By:	WJB	Identification:	B-1

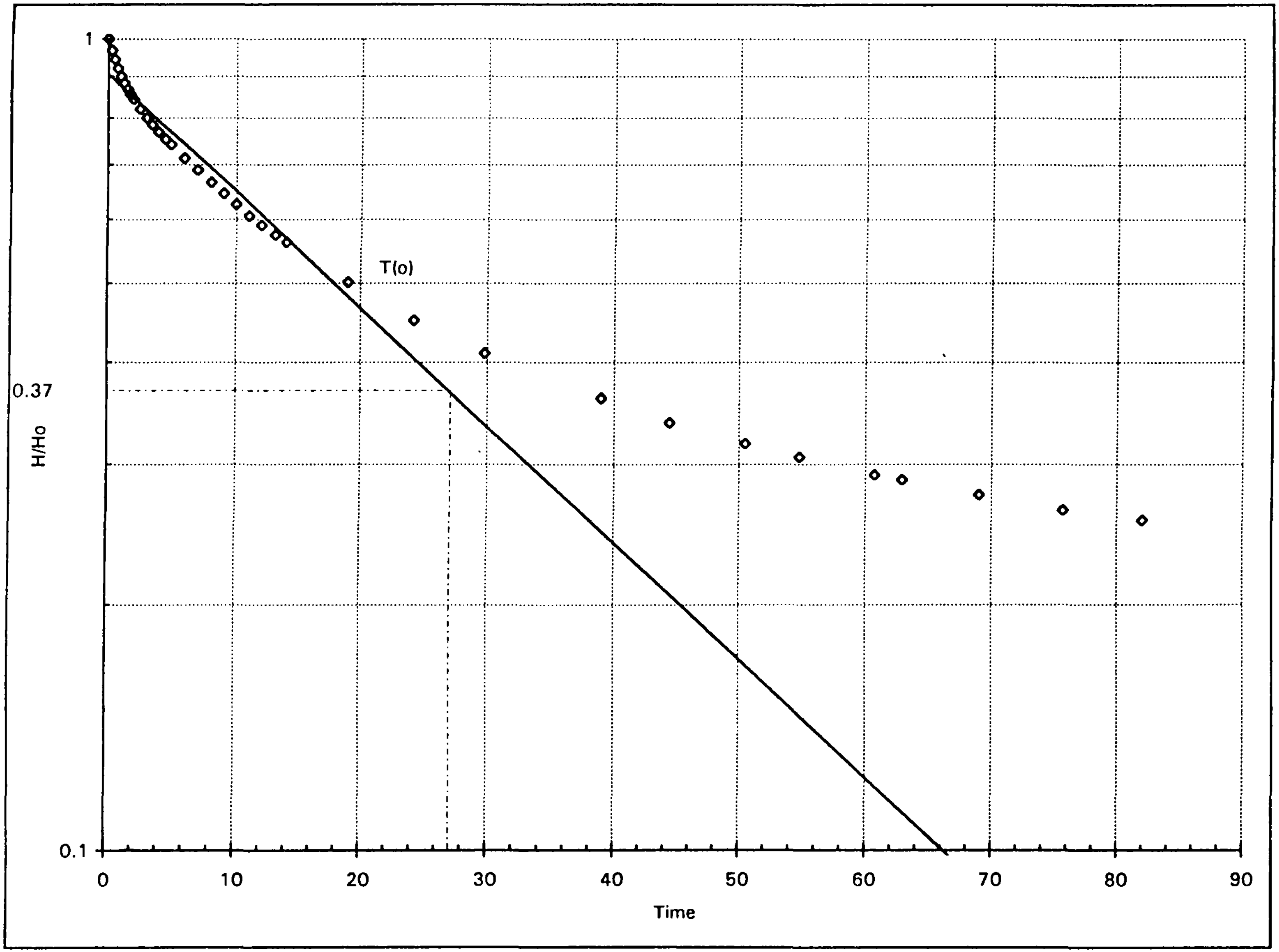
Test Type:	6	1 to 7
Riser Pipe Diameter:	0.5	feet
Intake Diam.:	0.689	feet
Intake Length:	20	feet
Water Table Depth:	18.32	feet
Line Fit Starting No.:	30	Min 1 to
Line Fit Ending No.:	55	Max 65
Entrapped Air Correct.:	N	Y or N
Specify Output Units:	7	1 to 9
Hyd Cond, K(h):	1.39E-04	cm./sec.
Basic Time Lag:	27.10	min.
Error of Fit:	0.0505	



Meas. No.	Time minutes	Field Meas. feet	Drawdown/up feet	Line Fit To LN(Hi/H-HO)	Regression To LN(Hi/H-HO)
1)	0.03	22.10	3.78	0.5772	-0.0665
2)	0.06	22.07	3.75	0.5705	-0.0675
3)	0.10	21.86	3.54	0.5126	-0.0688
4)	0.13	21.73	3.41	0.4760	-0.0698
5)	0.16	21.61	3.29	0.4383	-0.0708
6)	0.20	21.50	3.18	0.4042	-0.0721
7)	0.23	21.39	3.07	0.3690	-0.0731
8)	0.26	21.28	2.96	0.3326	-0.0741
9)	0.30	21.17	2.85	0.2947	-0.0755
10)	0.33	21.06	2.74	0.2553	-0.0765
11)	0.36	20.96	2.64	0.2207	-0.0775
12)	0.40	20.88	2.56	0.1882	-0.0788
13)	0.43	20.74	2.42	0.1305	-0.0798
14)	0.46	20.64	2.32	0.0912	-0.0808
15)	0.50	20.69	2.37	0.1129	-0.0821
16)	0.53	20.69	2.37	0.1094	-0.0831
17)	0.56	20.66	2.34	0.0985	-0.0841
18)	0.60	20.63	2.31	0.0876	-0.0854
19)	0.63	20.61	2.29	0.0767	-0.0864
20)	0.66	20.59	2.27	0.0692	-0.0874
21)	0.70	20.57	2.25	0.0580	-0.0888
22)	0.73	20.56	2.24	0.0542	-0.0898
23)	0.76	20.53	2.21	0.0429	-0.0908
24)	0.80	20.52	2.20	0.0352	-0.0921
25)	0.83	20.51	2.19	0.0313	-0.0931
26)	0.86	20.49	2.17	0.0235	-0.0941

27)	0.90	20.47	2.15	0.0157	-0.0954
28)	0.93	20.47	2.15	0.0117	-0.0964
29)	0.96	20.45	2.13	0.0040	-0.0974
30)	1.00	20.44	2.12	0.0000	-0.0987
31)	1.26	20.37	2.05	-0.0326	-0.1074
32)	1.50	20.32	2.00	-0.0575	-0.1154
33)	1.76	20.27	1.95	-0.0831	-0.1240
34)	2.03	20.23	1.91	-0.1051	-0.1330
35)	2.26	20.20	1.88	-0.1228	-0.1407
36)	2.53	20.16	1.84	-0.1411	-0.1496
37)	2.73	20.14	1.82	-0.1551	-0.1563
38)	3.00	20.11	1.79	-0.1689	-0.1653
39)	3.50	20.06	1.74	-0.1978	-0.1819
40)	4.03	20.02	1.70	-0.2223	-0.1995
41)	4.46	19.98	1.66	-0.2425	-0.2138
42)	4.96	19.95	1.63	-0.2628	-0.2305
43)	5.53	19.92	1.60	-0.2839	-0.2494
44)	5.96	19.89	1.57	-0.3000	-0.2637
45)	6.96	19.83	1.51	-0.3383	-0.2970
46)	8.00	19.78	1.46	-0.3723	-0.3316
47)	9.06	19.73	1.41	-0.4078	-0.3668
48)	10.03	19.69	1.37	-0.4381	-0.3991
49)	11.00	19.65	1.33	-0.4696	-0.4314
50)	12.03	19.60	1.28	-0.5018	-0.4656
51)	13.00	19.57	1.25	-0.5287	-0.4979
52)	14.10	19.54	1.22	-0.5563	-0.5345
53)	15.03	19.51	1.19	-0.5770	-0.5654
54)	20.00	19.38	1.06	-0.6899	-0.7307
55)	25.23	19.27	0.95	-0.7985	-0.9047
56)	30.80	19.19	0.87	-0.8913	-1.0899
57)	40.00	19.09	0.77	-1.0154	-1.3959
58)	45.46	19.04	0.72	-1.0841	-1.5775
59)	51.50	19.00	0.68	-1.1445	-1.7784
60)	55.76	18.97	0.65	-1.1830	-1.9201
61)	61.73	18.94	0.62	-1.2359	-2.1187
62)	63.90	18.93	0.61	-1.2498	-2.1908
63)	70.03	18.90	0.58	-1.2927	-2.3947
64)	76.70	18.88	0.56	-1.3375	-2.6166
65)	83.03	18.86	0.54	-1.3676	-2.8271

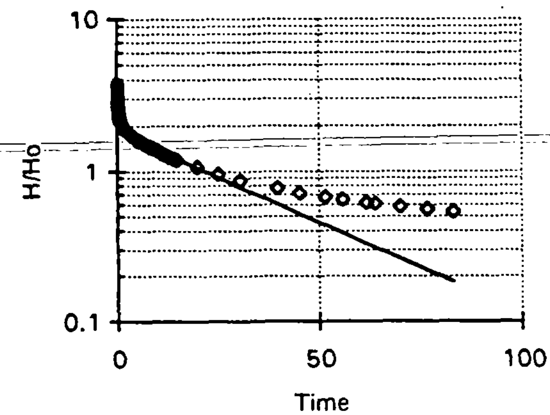
Hvorslev MainChart



Bouwer & Rice Method for Calculating Hydraulic Conductivity

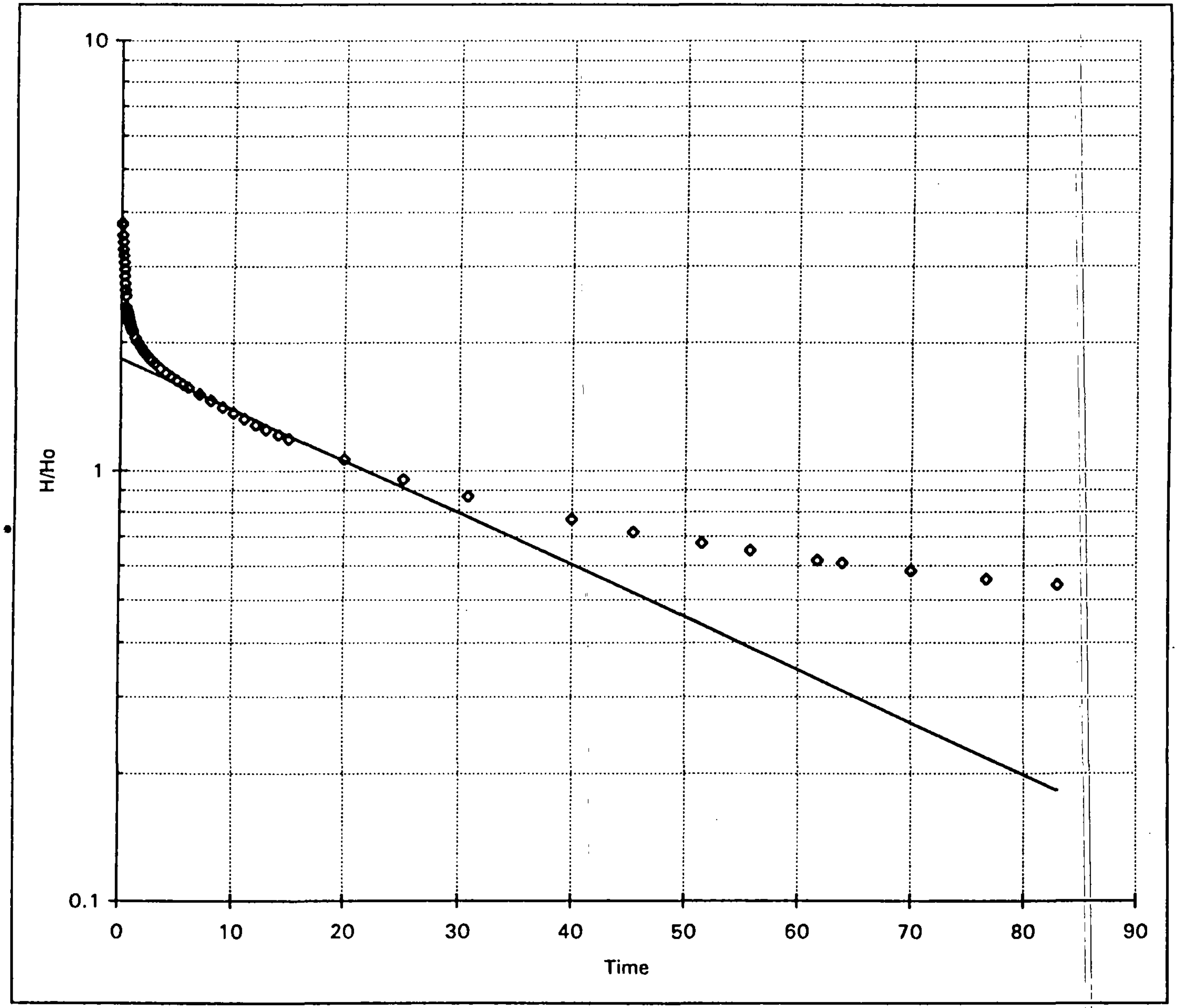
Project Name: Warren Co. PCB Landfill
Project No.: 1054-97-670
Client Name: N.C. Div.of Waste Mgmt.
Identification: B-1
Analysis By: WJB
Run Date: 3/7/97

Riser Pipe Diameter:	0.5	feet
Intake Diameter:	0.689	feet
Intake Length:	20	feet
Saturated Column Length:	11.14	feet
Water Table Depth:	18.32	feet
Aquifer Thickness:	11.14	feet
Line Fit Starting No.:	40	Min 1 to
Line Fit Ending No.:	55	Max 65
Specify Output Units:	7	1 to 9
Hyd. Cond., K(h):	6.02E-05	cm./sec.
Error of Fit:	0.007	



Meas. #	Time minutes	Field Meas. feet	Drawdown/up feet		Line Fit To LN(Yt)	Regression On LN(Yt)
1)	0.03	22.10	3.78		1.329	0.608
2)	0.06	22.07	3.75		1.322	0.607
3)	0.10	21.86	3.54		1.264	0.606
4)	0.13	21.73	3.41		1.227	0.605
5)	0.16	21.61	3.29		1.190	0.605
6)	0.20	21.50	3.18		1.156	0.603
7)	0.23	21.39	3.07		1.120	0.603
8)	0.26	21.28	2.96		1.084	0.602
9)	0.30	21.17	2.85		1.046	0.601
10)	0.33	21.06	2.74		1.007	0.600
11)	0.36	20.96	2.64		0.972	0.599
12)	0.40	20.88	2.56		0.940	0.598
13)	0.43	20.74	2.42		0.882	0.597
14)	0.46	20.64	2.32		0.843	0.596
15)	0.50	20.69	2.37		0.864	0.595
16)	0.53	20.69	2.37		0.861	0.594
17)	0.56	20.66	2.34		0.850	0.593
18)	0.60	20.63	2.31		0.839	0.592
19)	0.63	20.61	2.29		0.828	0.592
20)	0.66	20.59	2.27		0.821	0.591
21)	0.70	20.57	2.25		0.809	0.590
22)	0.73	20.56	2.24		0.806	0.589
23)	0.76	20.53	2.21		0.794	0.588
24)	0.80	20.52	2.20		0.787	0.587
25)	0.83	20.51	2.19		0.783	0.586

26)	0.86	20.49	2.17		0.775	0.585
27)	0.90	20.47	2.15		0.767	0.584
28)	0.93	20.47	2.15		0.763	0.583
29)	0.96	20.45	2.13		0.755	0.582
30)	1.00	20.44	2.12		0.751	0.581
31)	1.26	20.37	2.05		0.719	0.574
32)	1.50	20.32	2.00		0.694	0.567
33)	1.76	20.27	1.95		0.668	0.560
34)	2.03	20.23	1.91		0.646	0.553
35)	2.26	20.20	1.88		0.629	0.546
36)	2.53	20.16	1.84		0.610	0.539
37)	2.73	20.14	1.82		0.596	0.533
38)	3.00	20.11	1.79		0.582	0.526
39)	3.50	20.06	1.74		0.554	0.512
40)	4.03	20.02	1.70		0.529	0.497
41)	4.46	19.98	1.66		0.509	0.485
42)	4.96	19.95	1.63		0.489	0.471
43)	5.53	19.92	1.60		0.468	0.455
44)	5.96	19.89	1.57		0.451	0.443
45)	6.96	19.83	1.51		0.413	0.415
46)	8.00	19.78	1.46		0.379	0.386
47)	9.06	19.73	1.41		0.344	0.357
48)	10.03	19.69	1.37		0.313	0.330
49)	11.00	19.65	1.33		0.282	0.303
50)	12.03	19.60	1.28		0.250	0.274
51)	13.00	19.57	1.25		0.223	0.247
52)	14.10	19.54	1.22		0.195	0.217
53)	15.03	19.51	1.19		0.174	0.191
54)	20.00	19.38	1.06		0.062	0.053
55)	25.23	19.27	0.95		-0.047	-0.093
56)	30.80	19.19	0.87		-0.140	-0.248
57)	40.00	19.09	0.77		-0.264	-0.504
58)	45.46	19.04	0.72		-0.333	-0.656
59)	51.50	19.00	0.68		-0.393	-0.824
60)	55.76	18.97	0.65		-0.432	-0.942
61)	61.73	18.94	0.62		-0.485	-1.108
62)	63.90	18.93	0.61		-0.498	-1.169
63)	70.03	18.90	0.58		-0.541	-1.339
64)	76.70	18.88	0.56		-0.586	-1.525
65)	83.03	18.86	0.54		-0.616	-1.701



H/Ho
10
1
0.1
0
10
20
30
40
50
60
70
80
90
Time

Warren County PCB Landfill
Field Data For
"Slug Out" Test - Well B-1

S/N SDEE-03A-SN-3521   Block 1

Program: INTERVAL
Readings: 2547
Start Time: 14:37:40
Start Date: 03/07
Range: 0015 PSI
Channels: 1
Units: Ft-H2O

Interval: 00:00:02

Time	Chnl 1	Time	Chnl 1
0	11.305	1.47	9.1505
0.4	11.229	1.5	9.159
0.43	11.102	1.53	9.1755
0.47	10.764	1.57	9.184
0.5	10.3415	1.6	9.1925
0.53	9.3445	1.63	9.1925
0.57	8.4155	1.67	9.201
0.6	7.528	1.7	9.218
0.63	7.5535	1.73	9.2265
0.67	7.7645	1.77	9.235
0.7	7.8915	1.8	9.2435
0.73	8.018	1.83	9.252
0.77	8.128	1.87	9.26
0.8	8.238	1.9	9.2685
0.83	8.3475	1.93	9.277
0.87	8.4575	1.97	9.2855
0.9	8.5675	2	9.294
0.93	8.6605	2.03	9.294
0.97	8.745	2.07	9.3025
1	8.8885	2.1	9.311
1.03	8.9815	2.13	9.3195
1.07	8.9305	2.17	9.3195
1.1	8.939	2.2	9.328
1.13	8.9645	2.23	9.3365
1.17	8.99	2.27	9.3365
1.2	9.015	2.3	9.3445
1.23	9.032	2.33	9.353
1.27	9.0575	2.37	9.3615
1.3	9.066	2.43	9.37
1.33	9.091	2.5	9.3785
1.37	9.108	2.53	9.387
1.4	9.1165	2.6	9.3955
1.43	9.1335	2.67	9.404

Time	Chnl 1	Time	Chnl 1
2.7	9.4125	6.37	9.725
2.77	9.421	6.4	9.725
2.83	9.429	6.43	9.725
2.9	9.4375	6.47	9.725
2.97	9.446	6.53	9.7335
3.03	9.4545	6.6	9.742
3.1	9.463	6.73	9.7505
3.17	9.4715	6.9	9.7585
3.23	9.48	7.07	9.767
3.3	9.4885	7.23	9.7755
3.4	9.497	7.37	9.784
3.5	9.505	7.53	9.7925
3.57	9.5135	7.67	9.801
3.67	9.522	7.87	9.8095
3.7	9.5305	8.03	9.818
3.8	9.539	8.23	9.8265
3.87	9.5475	8.43	9.835
4	9.556	8.57	9.843
4.07	9.5645	8.73	9.8515
4.2	9.573	8.97	9.86
4.27	9.5815	9.1	9.8685
4.37	9.5895	9.37	9.877
4.5	9.598	9.47	9.8855
4.6	9.6065	9.63	9.894
4.7	9.615	9.83	9.9025
4.83	9.6235	10.07	9.911
4.97	9.632	10.2	9.9195
5.03	9.6405	10.4	9.9275
5.2	9.649	10.6	9.936
5.3	9.6575	10.8	9.9445
5.43	9.666	10.97	9.953
5.53	9.674	11.17	9.9615
5.67	9.6825	11.33	9.9615
5.8	9.691	11.37	9.97
5.93	9.6995	11.57	9.9785
6.1	9.708	11.97	9.9955
6.13	9.708	12.17	10.004
6.17	9.708	12.4	10.012
6.2	9.7165	12.6	10.0205
6.23	9.7165	12.87	10.029
6.27	9.7165	13.37	10.046
6.3	9.7165	13.57	10.0545
6.33	9.7165	13.83	10.063

Warren County PCB Landfill
Field Data For
"Slug Out" Test in Well B-1

S/N SDEE-03A-SN-3521 Block 1

Program: INTERVAL
Readings: 2547
Start Time: 14:37:40
Start Date: 03/07
Range: 0015 PSI
Channels: 1
Units: Ft-H2O

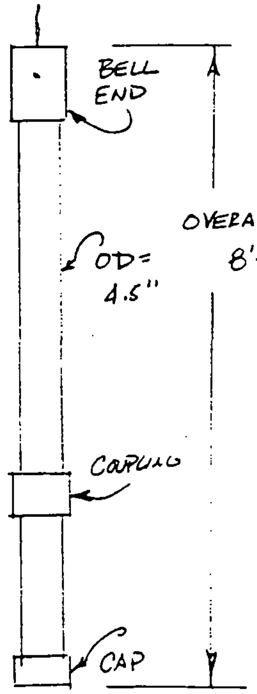
Interval: 00:00:02

Time	Chnl 1	Time	Chnl 1
14.13	10.0715	28.93	10.401
14.4	10.08	29.63	10.4095
14.67	10.0885	30.1	10.418
15.1	10.0965	31.37	10.4345
15.6	10.1135	32.03	10.443
15.93	10.122	32.67	10.4515
16.33	10.1305	33.43	10.46
16.6	10.139	34.7	10.477
16.9	10.1475	35.53	10.4855
17.2	10.156	36.07	10.494
17.5	10.1645	37.03	10.5025
18.13	10.181	38.7	10.519
18.5	10.1895	39.63	10.5275
18.9	10.198	40.57	10.536
19.23	10.2065	41.5	10.5445
19.53	10.215	43	10.5615
20.2	10.232	44	10.57
20.57	10.2405	45.07	10.5785
20.9	10.249	46.03	10.587
21.2	10.257	48.4	10.6035
21.63	10.2655	49.7	10.612
22	10.274	52.07	10.629
22.8	10.291	56.33	10.6545
23.63	10.308	57.9	10.663
24.07	10.3165	59.43	10.6715
24.37	10.325	62.3	10.688
24.73	10.3335	64.47	10.6965
25.8	10.35	68.3	10.7135
26.33	10.3585	70.6	10.722
26.77	10.367	75.2	10.739
26.8	10.367	77.27	10.7475
28.23	10.384	83.6	10.764
28.4	10.3925		

S&ME

JOB NO. 1054-97-670
SHEET NO. 1
DATE 4-6-97

JOB NAME WARREN COUNTY PCB LANDFILL
COMPUTED BY WJB
SUBJECT CALCULATION OF SLUG VOLUME
CHECKED BY



SLUG IS CONSTRUCTED OF 4" PVC PIPE WITH A BELL END COUPLING & CAP.

OD OF PIPE IS 4.5"
OD OF COUPLING IS 5"

LENGTH OF PIPE IS 7.2'
LENGTH OF 5" OD = 0.8'

VOLUME OF PIPE

(2.25")^2 x 3.14 / 144 = 0.110 sf/ft
0.110 x 7.2' = 0.7948 cuft.

VOLUME OF CAP, END & COUPLING

(2.5")^2 x 3.14 / 144 = 0.1364
.0136 x 0.8 = .1091

TOTAL (ACTUAL VOLUME)

.7948 + .1091 = 0.90 cuft.

CALCULATION OF VOLUME OF WELL & SANDPACK

PIPE
6" PVC PIPE VOLUME =
(3)^2 x 3.1416 / 144 =

.19 cuft / ft

SANDPACK
6.625" OD OF SCREEN
12.5" OD OF BOREHOLE
POROSITY = 30%

((6.25)^2 - (3.31)^2) 3.1416 / 144 =
(39.065 - 10.96) = .613 x 30% ~ .18

Combined volume = .19 cuft + .18 cuft = .37 cuft / ft.

CALCULATION OF THEORETICAL DISPLACEMENT.

.90 cuft / .37 cuft/ft = 2.43 feet.

∴ Insertion of slug should show about 2.4 feet of change in water level in well.

Appendix 8
Pictures of Top Liner

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: ROBERTS/STEPHENS Well #: 4d (OLD)

Comments (well construction, etc): ____

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

1 Well Volume (gal): ~~13~~ 13.3 GAL 3 Well Volumes (gal): 40 gals Purge Equipment: BAILER

Date Purged: 4/8/97 Purge Time Start: 1712 Purge Time End: 1910

Did well purge dry? Y N Actual purge volume: 40 gals

	Volume 1	Volume __	Volume __	Volume __	Volume __	Volume __
Temp (°C)	13.2	13.0	12.8			
pH	5.45	5.35	5.40			
S. C.	67	59	61			
D. O.	6.6	6.5	6.8			
Turbidity	11.5	10	9.9			

Sample Information

Sample Date: 4/8/97 Sample Time: 1915 Sample Equipment: BAILER

Water Condition (turbidity, odor, etc.): ____

Samples Collected (✓):

✓ VOCs (2 40 ml vials) ✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle) ✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 12.9 pH: 5.74 SC(umhos): 60 DO(ppm): 6.8 Turb(NTUs): 11

Comments: ____

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: ROBERTS/STEPHENS Well #: 4S (new well)

Comments (well construction, etc): /

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 3.33 gals 3 Well Volumes (gal): 10 gals Purge Equipment: PERIST.

Date Purged: 4/8/97 Purge Time Start: 1700 hrs ~~Purge Time~~ End: 1755 (CBS 4/8/97)

Did well purge dry? Y N Actual purge volume: 11 ~~10~~ gal

	Volume 1	Volume 2	Volume 3	Volume __	Volume __	Volume __
Temp (°C)	14.9	14.9	14.8			
pH	5.80	5.91	5.95			
S. C.	88	93	90.1			
D. O.	4.0	4.1	4.5			
Turbidity	3.25	2.59	1.50	~~1.59~~ CBS 4/8/97		

Sample Information

Sample Date: 4/8/97 Sample Time: 1805 Sample Equipment: PERIST.

Water Condition (turbidity, odor, etc.):

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 14.2 pH: 5.63 SC(umhos): 89 DO(ppm): 4.2 Turb(NTUs): 1.59

Comments:

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Moore / Stanley (Team 4) Well #: MW-3D (3A)

Comments (well construction, etc):

Total Depth = 65.58' Depth to Water Table = 21.35' 44.23' column Stainless steel 2 inch dia.

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

Purge Information

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 7.372 3 Well Volumes (gal): 22.115 Purge Equipment: Peristaltic Pump.

Date Purged: 4/7/97 Purge Time Start: 16:10 Purge Time End: 18:23

Did well purge dry? Y N . Actual purge volume:

	16:10 Volume 0	16:54 44 mins Volume 1	~~17:38~~ 17:45 88 mins Volume 2	~~18:01~~ 18.02 111 mins Volume 2½	~~18:23~~ 133 mins Volume 3	at sample Volume
Temp (°C)	17.7	17.1	15.2	15.6	15.5	16.0
pH	11.14	7.36	7.33	7.31	7.00	7.46
S. C.	188.6	178.6	161.6	156.1	118.6	166.0
D. O.	4.4	2.3	2.7	2.9	2.9	5.0
Turbidity	11.0 NTU	7.0 NTU	20	120	91.0	40.0

Sample Information

Sample Date: 4/8/97 Sample Time: 11:00-12:45 Sample Equipment: peristaltic pump

Water Condition (turbidity, odor, etc.): slightly cloudy, no odor

Samples Collected (✓):

2 VOCs (2 40 ml vials) 2 Dioxin (1 1L bottle)

1 SVOCs/PCBs (1 2L Amber bottle) 1 Pest./Herb. (1 2L amber bottle)

1 Metals (1 1L HDPE bottle) - acidified 1245 4/8/97

Temp(°C): 16.0 pH: 7.46 SC(umhos): 166.0 DO(ppm): 5.0 Turb(NTUs): 40.0

Comments: at 1710, shut off peristaltic pump + began to purge w/bailer. (Lost pressure) 4.8 gallons bailed for rest of 2nd volume; bailed 3rd volume & allowed to sit overnight for turbidity to decrease

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: MOORE/STANLEY (TEAM 4) Well #: MW-35

Comments (well construction, etc):

Total Depth = 40.82' Depth to Water = 20.20' Column = 20.62' 4 inch dia. PVC

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
~~For bailers: 4 bails = 1 gallon~~

Purge Information

1 Well Volume (gal): 13.747 3 Well Volumes (gal): 41.24 Purge Equipment: Peristaltic pump

Date Purged: 4/7/97 Purge Time Start: 16:15 Purge Time End: 19:19

Did well purge dry? Y N Actual purge volume:

	16:15 Volume 0	17:26 82 mins Volume 1	18:03 165 mins Volume 2	18:41 207 mins Volume 2 1/2	19:19 248 mins Volume 3	Volume __
Temp (°C)	17.7	17.2	15.7	15.9	15.6	
pH	6.99	6.75	6.81	7.00	6.75	
S. C.	59.2	59.2	58.7	60.4	59.4	
D. O.	6.2	4.6	4.8	4.7	5.15	
Turbidity	0 NTU	1	5.35	6.71	0.29	

Sample Information

Sample Date: 4-7-97 Sample Time: 20:00 Sample Equipment: Peristaltic pump

Water Condition (turbidity, odor, etc.): Water clear, No odor, turbidity from 19:19 at 0.29 NTU.

Samples Collected (✓):

✓ VOCs (2 40 ml vials) ✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle) ✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 15.6 pH: 6.75 SC(umhos): 59.4 DO(ppm): 5.15 Turb(NTUs): 0.29

Comments: at 1715, added 2nd peristaltic pump to well thereby doubling purge rate. Replaced cramped tubing on pump, purge rate increased pcbwells.frm
again slightly. 2.75 min/gal w/ 2 pumps running.

WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Doug Moore / Jeanette Stanley Well #: MW-2

Comments (well construction, etc): Depth 46.86 stickup 2.09 Depth of water 32.60

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 9.6 (38 bailers) 3 Well Volumes (gal): 28.6 (114 bailers) Purge Equipment: Bailer

Date Purged: 4/9/97 Purge Time Start: 09:40 Purge Time End: 11:07

Did well purge dry? Y (N) Actual purge volume: ____

	Volume 0 (09:40)	Volume 1 ((38) 10:10)	Volume 2 ((76) 10:40)	Volume 2½ ((95) 10:55)	Volume 3 ((114) 11:07)	Volume __
Temp (°C)	15.2	14.5	14.4	14.6	14.9	
pH	6.85	6.83	6.83	6.80	6.78	
S. C.	105.3	101.7	102.9	111.2	110.1	
D. O.	4.3 ppm	4.6 ppm	5.0 ppm	4.9 ppm	5.1 ppm	
Turbidity	0.24 NTU	5.81 NTU	8.42 NTU	7.05 NTU	6.78 NTU	

Sample Information

Sample Date: 4/8/97 Sample Time: 11:45 Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.): clear, no odor.

Samples Collected (✓):

✓ VOCs (2 40 ml vials)
✓ Dioxin (1 1L bottle)
✓ SVOCs/PCBs (1 2L Amber bottle)
✓ Pest./Herb. (1 2L amber bottle)
✓ Metals (1 1L HDPE bottle)

Temp(°C): 14.8 pH: 6.56 SC(umhos): 107.5 DO(ppm): 5.3 ppm Turb(NTUs): 2.48 NTU

Comments: ____

WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: MOORE/STANLEY (TEAM 4) Well #: MW-1A

Comments (well construction, etc): Depth of Well - 43.37' Depth of Water - 40.22'

Water Column - 3.15' 2 inch diameter

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

Purge Information

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

~~For bailers: 4 bails = 1 gallon~~

1 Well Volume (gal): 0.525 gal (3 bailers) 3 Well Volumes (gal): 1.575 gallons (7 bailers) Purge Equipment: Bailer

Date Purged: 4/8/97 Purge Time Start: 1440 Purge Time End: 1455

Did well purge dry? Y N Actual purge volume: ______

	1440	1445	1450	1455		
	Volume 0	Volume 1	Volume 2	Volume 3	Volume __	Volume __
Temp (°C)	15.8	15.1	15.2	15.4		
pH	7.24	7.16	7.34	7.48		
S. C.	258	274	224	216		
D. O.	2.0	4.7	4.4	4.4		
Turbidity	4.13	462	483	963		

Sample Information

Sample Date: 4/9/97 Sample Time: 154 Sample Equipment: VOAs w/ Bailer Sub. Pump w/ Teflon Tubing

Water Condition (turbidity, odor, etc.): Very turbid, orange/mud.

Sampled VOAs w/ Bailer. Turbidity 47.6 NTU.

Samples Collected (✓):

✓ VOCs (2 40 ml vials) w/ Bailer

✓ Dioxin (1 1L bottle) (2)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 20.3 pH: 5.92 SC(umhos): 55mV DO(ppm): 4.1 Turb(NTUs): 86.7

Comments: 4/8/97 Left well at 1500 to allow settling. Parameters taken 4/9/97 after sampling containers filled. Well dry @ conclusion of sampling event.

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WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: D. Moore/J. Stanley (Team 4) Well #: MW-1

Comments (well construction, etc): Depth of well - 51.93' Depth of Water - 42.54'
Water Column - 9.39' 4 inch dia. well

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 6.26 gals (25 bailers) 3 Well Volumes (gal): 18.78 gals (75 bails). Purge Equipment: Bailer

Date Purged: 4/8/97 Purge Time Start: 15:45 Purge Time End: 17:10

Did well purge dry? Y N Actual purge volume: ______

	15:45 Volume 0	(25) 16:05 Volume 1	(50) 16:25 Volume 2	(63) 16:50 Volume 2 1/2	(75) 17:10 Volume 3	Volume __
Temp (°C)	16.0	15.3	15.3	15.3	15.4	
pH	6.79	6.81	6.79	6.78	6.76	
S. C.	107.6	119.8	110.3	103.8	114.0	
D. O.	5.5 ppm	5.8 ppm	5.1 ppm	5.7 ppm	5.7 ppm	
Turbidity	0.69 NTU	28.5 NTU	21.9 NTU	59.5 NTU	65.4 NTU	

Sample Information

Sample Date: 4/8/97 Sample Time: 18:15 Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.): Clear, No Odor

Samples Collected (✓):

✓ VOCs (2 40 ml vials)
✓ SVOCs/PCBs (1 2L Amber bottle)
✓ Metals (1 1L HDPE bottle)
✓ Dioxin (1 1L bottle)
✓ Pest./Herb. (1 2L amber bottle)

Temp(°C): 15.0 pH: 6.21 SC(umhos): 99.4 DO(ppm): 6.0 Turb(NTUs): 9.43

Comments: Following 3 volume purge, turbidity >50 NTU; allowed to recharge 1 hr, then sampled at 18:15. Turbidity at 18:15 = 9.43 NTU

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Doug Rumford / Rusty H-B Well #: OSW #4

Comments (well construction, etc): 4" well Measurements from Top of Casing

68.75 Depth of well 44.39 depth to Water 24.36 standing Water

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

~~For bailers: 4 bails = 1 gallon~~

Purge Information

1 Well Volume (gal): 15.9 gal 3 Well Volumes (gal): 46.8 Purge Equipment: Grundfos 2" /MP1

Date Purged: 4 7 97 Purge Time Start: 2:28 pm Purge Time End:

Did well purge dry? Y N Actual purge volume:

DO Conversion / Calibration 7.95

Initial	1530 Volume 1	1550 Volume 2	1615 Volume 3	Volume ___	Volume ___	Volume ___
Temp (°C) 20.9	21.3	20.7	20.7	~~[illegible]~~		
pH 6.22	6.21	6.23	6.17			
S. C. 38	~~[illegible]~~ 38	36	40			
D. O. 4.17	3.98	4.03	4.10			
Turbidity 20.4	10.9	19.9	23.8			

pH meter calibration @ 10:45
4.057 in 4.0 solution
7.06 in 7.0 solution

1440 Purge Rate 3 minutes per gallon
1530 . Purge Rate 1.5 minutes per gallon

Sample Information

Sample Date: Sample Time: 1645 Sample Equipment: Teflon Bailer w/ leader & Nylon Rope

Water Condition (turbidity, odor, etc.):

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 20.6 pH: 6.14 SC(umhos): 42 DO(ppm): 4.35 Turb(NTUs): 35.1

Comments: Sample Parameters ~~[illegible]~~ Taken After Sample Collection

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WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Stanley Well #: OSW-3

Comments (well construction, etc): Total Depth = 54'

Standing Wtr = 16.11 ft

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 10.7 3 Well Volumes (gal): 32.2 Purge Equipment: Bailer

Date Purged: 4/8/97 Purge Time Start: 10:30 Purge Time End: 12:15 pm

Did well purge dry? Y N. Actual purge volume: 32 gal

	Volume 0	Volume 1	Volume 2	Volume 2 1/2	Volume 3	Volume __
Temp (°C)	11.5	11.3	11.49	11.9	11.2	
pH	5.53	5.95	5.68	5.59	5.56	
S. C.	226	217	228	241	243	
D. O.						
Turbidity	0.58	14.10	7.45	5.25	3.38	

Sample Information

Sample Date: 4/8/97 Sample Time: 12:30 pm Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.): uderless / colorless clear

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 12.1 pH: 5.53 SC(umhos): 249 DO(ppm): Not Taken* Turb(NTUs): 3.05

Comments: Drawdown minimal during purging. Est at 18 inches. *No DO meter.

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WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: ROBERTS STEPHENS Well #: OSW-2

Comments (well construction, etc):

16.3 [illegible]

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
~~For bailers: 4 bails = 1 gallon~~

1 Well Volume (gal): 11 gal 3 Well Volumes (gal): 33 gals Purge Equipment: TEFLON BAILERS

Date Purged: 4/8/97 Purge Time Start: 10:00 Purge Time End: 11:55

Did well purge dry? Y N . Actual purge volume: 40 gals

	Volume 1	Volume 2	Volume 3	Volume 3.5	Volume __	Volume __
Temp (°C)	14.9	14.7	14.7			
pH	5.70	5.89	5.92			
S. C.	97.5	95.5	95.7			
D. O.	6.0	6.9	6.9			
Turbidity	9.0	84.5 53	53	~~4~~ 40 ~~30~~		

Sample Information

Sample Date: 4/8/97 Sample Time: 1200 Sample Equipment: TEFLON BAILERS

Water Condition (turbidity, odor, etc.):

Samples Collected (✓):

✓ 2 VOCs (2 40 ml vials)

✓ Dioxin (1 1L bottle)

✓ 2 SVOCs/PCBs (1 2L Amber bottle)

✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 14.9 pH: 6.10 SC(umhos): 93.1 DO(ppm): 6.8 Turb(NTUs): 30

Comments: .08 actual reading for calibration using the .2 standard

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Appendix 10
Field Data Sheets and Logs

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-12

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON NC County: ______
LIMER TOWN RD
(Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
ADDRESS ______
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code
3. DATE DRILLED 3-97 USE OF WELL ______
4. TOTAL DEPTH 36.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

Depth From	To		Diameter	Wall Thickness or Weight/Ft.	Material
0.0	26.0	Ft.	2"	SCH 5	S.S
		Ft.			
		Ft.			

13. GROUT:

Depth From	To		Material	Method
0.0	22.0	Ft.	PORTLAND	POUR
		Ft.		

14. SCREEN:

Depth From	To		Diameter		Slot Size		Material
26.0	36.0	Ft.	2"	in.	.010	in.	S.S
		Ft.		in.		in.	
		Ft.		in.		in.	

15. SAND/GRAVEL PACK:

Depth From	To		Size	Material
24.0	36.0	Ft.	#2	SILICA SAND
		Ft.		

16. REMARKS: ______

DRILLING LOG

DEPTH From	To	Formation Description
0-10		RED SILTY CLAY
10-20		↓
20-30		↓
30-36		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 3-12-97
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ______

MW-11

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON NC County: ______
LIMBER TOWN RD
(Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
ADDRESS ______
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code
3. DATE DRILLED 3-97 USE OF WELL ______
4. TOTAL DEPTH 40.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 30.0 Ft.	2"	SCH 5	S.S
From	To Ft.			
From	To Ft.			

13. GROUT:

Depth		Material	Method
From 0.0	To 26.0 Ft.	PORTLAND	POUR
From	To Ft.		

14. SCREEN:

Depth		Diameter	Slot Size	Material
From 30.0	To 40.0 Ft.	2" in.	.010 in.	S.S
From	To Ft.	in.	in.	
From	To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth		Size	Material
From 28.0	To 40.0 Ft.	#2	SILICA SAND
From	To Ft.		

16. REMARKS: ______

DEPTH From - To	DRILLING LOG Formation Description
0 - 10	RED SILTY CLAY
10 - 20	" "
20 - 30	" "
30 - 40	PWR

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT DATE 3-12-97

GW-1 REV. 9/91
Submit original to Division of Environmental Management and copy to well owner

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ PO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ________

MW 10-S

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ________
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. RB LANDFILL
   ADDRESS ________ (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2-25-97 USE OF WELL MONITOR
4. TOTAL DEPTH 18'
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: ________ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ________ METHOD OF TEST ________
10. WATER ZONES (depth): ________
11. CHLORINATION: Type ________ Amount ________
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	0.0	To 8.0 Ft.	2"	SCH 5	S.S
From		To Ft.			
From		To Ft.			

13. GROUT:

	Depth		Material	Method
From	0.0	To 4.0 Ft.	PORTLAND	POUR
From		To Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From	8.0	To 18.0 Ft.	2" in.	.010 in.	S.S
From		To Ft.	in.	in.	
From		To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From	6.0	To 18.0 Ft.	#2	SILICA SAND
From		To Ft.		

16. REMARKS: BENTONITE 4-6

DRILLING LOG

DEPTH From	To	Formation Description
0	5	RED/BROWN S.C.
5	10	↓
10	15	↓
15	18	

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT ________ DATE 3-12-97

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ RO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ________

MW-10

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ________
   LIMER JAW RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
   ADDRESS ________
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2-22-97 USE OF WELL MONITOR
4. TOTAL DEPTH 76.0
5. CUTTINGS COLLECTED YES ✓ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: ________ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ________ METHOD OF TEST ________
10. WATER ZONES (depth): ________
11. CHLORINATION: Type ________ Amount ________
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 66.0	Ft.	2"	SCH 10	S.S
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 62.0	Ft.	PORTLAND	TRIMMY
From	To	Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From 66.0	To 76.0	Ft.	2 in.	.010 in.	S.S
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 64.0	To 76.0	Ft.	#2	SILICA SAND
From	To	Ft.		

16. REMARKS: ________

DEPTH From - To	DRILLING LOG Formation Description
0 - 10	RED SILTY CLAY
10 - 20	" "
20 - 30	" "
30 - 40	" "
40 - 50	" "
50 - 60	PWR
60 - 70	PWR
70 - 76	PWR

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature]
SIGNATURE OF CONTRACTOR OR AGENT

3-12-97
DATE

GW-1 REV. 9/91

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North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-9

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ______
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LAND FILL
   ADDRESS ______
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2/20/97 USE OF WELL MONITOR
4. TOTAL DEPTH 20.0
5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 10.0	Ft.	2"	SCH 10	S.S
From ______	To ______	Ft.			
From ______	To ______	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 6.0	Ft.	PORTLAND	POUR
From ______	To ______	Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From 10.0	To 20.0	Ft.	2" in.	.010 in.	S.S
From ______	To ______	Ft.	in.	in.	
From ______	To ______	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 8.0	To 20.0	Ft.	#2	SILICA SAND
From ______	To ______	Ft.		

16. REMARKS: ______

DEPTH From	To	DRILLING LOG Formation Description
0	10	RED SILTY CLAY
10	20	PWR
20	20	PWR / BED ROCK

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 3-12-97
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ RO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-8D

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON NC County: ________
   LIMBR TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
   ADDRESS ________ (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 3-97 USE OF WELL ________
4. TOTAL DEPTH 51.5
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ________ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ________ METHOD OF TEST ________
10. WATER ZONES (depth): ________
11. CHLORINATION: Type ________ Amount ________
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0.0	26.5 Ft.	2"	SCH 5	SS
	Ft.			
	Ft.			

13. GROUT:

Depth From	To	Material	Method
0.0	22.5 Ft.	PORTLAND	TRIMMY
	Ft.		

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
26.5	46.5 Ft.	2" in.	.010 in.	S.S
	Ft.	in.	in.	
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
24.5	51.5 Ft.	#2	SILICA SAND
	Ft.		

16. REMARKS: ________

DEPTH From - To	DRILLING LOG Formation Description
0 - 10	RED SILTY CLAY
10 - 20	" "
20 - 30	" "
30 - 40	" "
40 - 50	PWR
50 - 51.5	PWR

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 3-12-97
SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

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Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ P.O ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: AW-7A

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON NC County: ______
   LIMBR TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
   ADDRESS ______
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 3- -97 USE OF WELL ______
4. TOTAL DEPTH 35.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0.0	25.0 Ft.	2"	SCH 5	S.S
	Ft.			
	Ft.			

13. GROUT:

Depth From	To	Material	Method
0.0	21.0 Ft.	PORTLAND	PUR
	Ft.		

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
25.0	35.0 Ft.	2' in.	.010 in.	S.S
	Ft.	in.	in.	
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
23.0	35.0 Ft.	#2	SILICA SAND
	Ft.		

16. REMARKS: ______

DEPTH From	To	DRILLING LOG Formation Description
0	10	RED SILTY CLAY
10	20	" "
20	30	PWR
30	35	PWR

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

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[signature]
SIGNATURE OF CONTRACTOR OR AGENT

8-12-97
DATE

GW-1 REV. 9/91

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North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
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Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-7

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ______
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
   ADDRESS ______ (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2-28-97 USE OF WELL MONITOR
4. TOTAL DEPTH 46.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

From	To (Depth)	Diameter	Wall Thickness or Weight/Ft.	Material
0.0	36.0 Ft.	2"	SCH 5	S.S
	Ft.			
	Ft.			

13. GROUT:

From	To (Depth)	Material	Method
0.0	32.0 Ft.	PORTLAND	POUR
	Ft.		

14. SCREEN:

From	To (Depth)	Diameter	Slot Size	Material
36.0	46.0 Ft.	2 in.	.010 in.	S.S
	Ft.	in.	in.	
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

From	To (Depth)	Size	Material
34.0	46.0 Ft.	#2	SILICA SAND
	Ft.		

16. REMARKS: BENTONITE 32 - 34

DRILLING LOG

DEPTH From	To	Formation Description
0	10	RED SILTY CLAY
10	20	"
20	30	PWR
30	40	↓
40	46	

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

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[signature]
SIGNATURE OF CONTRACTOR OR AGENT

3-12-97
DATE

GW-1 REV. 9/91

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North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
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Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ PC ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ________

MW-6

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ________
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PB LAND FILL
   ADDRESS ________
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2-19-97 USE OF WELL MONITOR
4. TOTAL DEPTH 59.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: ________ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ________ METHOD OF TEST ________
10. WATER ZONES (depth): ________
11. CHLORINATION: Type ________ Amount ________
12. CASING:

	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0 To 49.0 Ft.		2"	SCH 10	S.S
From ____ To ____ Ft.				
From ____ To ____ Ft.				

13. GROUT:

Depth	Material	Method
From 0.0 To 45.0 Ft.	PORTLAND	TRIMMY
From ____ To ____ Ft.		

14. SCREEN:

Depth	Diameter	Slot Size	Material
From 49.0 To 59.0 Ft.	2" in.	.010 in.	S.S
From ____ To ____ Ft.	in.	in.	
From ____ To ____ Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth	Size	Material
From 47.0 To 59.0 Ft.	#2	SILICA SAND
From ____ To ____ Ft.		

16. REMARKS: ________

DRILLING LOG

DEPTH From	To	Formation Description
0	10	RED SILTY CLAY
10	20	" "
20	30	" "
30	40	" "
40	59	"

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT DATE 3-12-97

GW-1 REV. 9/91

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Division of Environmental Management - Groundwater Section
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Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-5

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON County: ______
LIMER TOWN RD
(Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
ADDRESS ______
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code
3. DATE DRILLED 3-6-97 USE OF WELL ______
4. TOTAL DEPTH 62.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

Depth From	To		Diameter	Wall Thickness or Weight/Ft.	Material
0.0	52.0	Ft.	2"	SCH 5	S.S
		Ft.			
		Ft.			

13. GROUT:

Depth From	To		Material	Method
0.0	48.0	Ft.	PORTLAND	TRIMMY
		Ft.		

14. SCREEN:

Depth From	To		Diameter	Slot Size	Material
52.0	62.0	Ft.	2" in.	.010 in.	S.S
		Ft.	in.	in.	
		Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To		Size	Material
50.0	62.0	Ft.	#2	SILICA SAND
		Ft.		

16. REMARKS: ______

DRILLING LOG

DEPTH From	To	Formation Description
0	10	ABD SILTY CLAY
10	20	" "
20	30	" "
30	40	" "
40	50	PWR
50	60	PWR
60	62	PWR

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

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[signature] 3-12-97
SIGNATURE OF CONTRACTOR OR AGENT DATE

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Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ RO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MWS-5

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ________
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. RB LANDFILL
   ADDRESS ________
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 3-6-97 USE OF WELL ________
4. TOTAL DEPTH 40.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ________ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ________ METHOD OF TEST ________
10. WATER ZONES (depth): ________
11. CHLORINATION: Type ________ Amount ________
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 30.0	Ft.	2"	SH S	S.S
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 26.0	Ft.	PORTLAND	POUR
From	To	Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From 30.0	To 40.0	Ft.	2" in.	.010 in.	S.S
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 28.0	To 40.0	Ft.	#2	SILICA SAND
From	To	Ft.		

16. REMARKS: ________

DEPTH From - To	DRILLING LOG Formation Description
0 - 10	RED SILTY CLAY
10 - 20	" "
20 - 30	" "
30 - 40	PWR

If additional space is needed use back of form.

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

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[signature] 8-12-97

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

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Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ______

MW - 4A

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON County: ______
LIMER SAW RD
(Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LAND FILL
ADDRESS ______
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code
3. DATE DRILLED 2-27-96 USE OF WELL MONITOR
4. TOTAL DEPTH 40.5
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0.0	30.5 Ft.	2"	SCH 5	S.S
	Ft.			
	Ft.			

13. GROUT:

Depth From	To	Material	Method
0.0	20.5 Ft.	PORTLAND	POUR
	Ft.		

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
30.5	40.5 Ft.	2" in.	.010 in.	S.S
	Ft.	in.	in.	
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
28.5	40.5 Ft.	#2	SILICA SAND
	Ft.		

16. REMARKS: BENTONITE 26.5 — 28.5

DEPTH / DRILLING LOG

From - To	Formation Description
0 - 10	RED SILTY CLAY
10 - 20	" " "
20 - 30	PWR
30 - 40.5	PWR

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT DATE 3-12-97

Submit original to Division of Environmental Management and copy to well owner

GW-1 REV. 9/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW 3 - A

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ______
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PB LAND FILL
   ADDRESS ______
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2-26-97 USE OF WELL MONITOR
4. TOTAL DEPTH 64.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: 2 FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 54.0	Ft.	2"	SCH 5	S.S
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 50.0	Ft.	PORTLAND	TRIMMY
From	To	Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From 54.0	To 64.0	Ft.	2" in.	.010 in.	S.S
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 52.0	To 64.0	Ft.	#2	SILICA SAND
From	To	Ft.		

16. REMARKS: BENTONITE 50 - 52

DEPTH From - To	DRILLING LOG Formation Description
0 - 10	BROWN/RED SILTY CLAY
10 - 20	"
20 - 30	"
30 - 40	"
40 - 50	PWR
50 - 64	

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 3-12-97

SIGNATURE OF CONTRACTOR OR AGENT DATE

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Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ PO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-4A

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON NC County: ______
______ (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
ADDRESS LIMER TOWN RD (Street or Route No.)
WARRENTON (City or Town) NC (State) ______ (Zip Code)
3. DATE DRILLED 3-97 USE OF WELL ______
4. TOTAL DEPTH 42.0
5. CUTTINGS COLLECTED YES ☑ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

From	Depth To	Ft. Diameter	Wall Thickness or Weight/Ft.	Material
0.0	32.0	2"	SCH 5	S.S

13. GROUT:

From	Depth To	Material	Method
0.0	28.0	PORTLAND	POUR

14. SCREEN:

From	Depth To	Diameter	Slot Size	Material
32.0	42.0	2" in.	.010 in.	S.S

15. SAND/GRAVEL PACK:

From	Depth To	Size	Material
30.0	32.0	#2	SILICA SAND

16. REMARKS: ______

DEPTH From - To	DRILLING LOG Formation Description
0 - 10	RED SILTY CLAY
10 - 20	" "
20 - 30	" "
30 - 42	PWR

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 3-12-97
SIGNATURE OF CONTRACTOR OR AGENT DATE

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Submit original to Division of Environmental Management and copy to well owner.

Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ RO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: OW4

OSW4

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON County: ________
LIMER TOWN RD
(Road, Community, or Subdivision and Lot No.)

2. OWNER WARREN CO. RB LANDFILL
ADDRESS ________
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code

3. DATE DRILLED 2-27-97 USE OF WELL ________
4. TOTAL DEPTH 68.0
5. CUTTINGS COLLECTED YES ☐ NO ☑
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ________ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ________ METHOD OF TEST ________
10. WATER ZONES (depth): ________
11. CHLORINATION: Type ________ Amount ________

DEPTH From – To	DRILLING LOG Formation Description
0 – 10	RED SILTY CLAY
10 – 20	" "
20 – 30	" "
30 – 40	" "
40 – 50	PWR
50 – 68	PWR.

If additional space is needed use back of form

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 58.0	Ft.	4"	SCH 5	S.S
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 54.0	Ft.	PORTLAND	TRIMMY
From	To	Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From 58.0	To 68.0	Ft.	2" in.	.010 in.	S.S
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 56.0	To 68.0	Ft.	#2	SILICA SAND
From	To	Ft.		

16. REMARKS: BENTONITE 54 – 56

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT 3-12-97 DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 9/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: OSW-3

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON County: ______
LIMER SAW RD
(Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
ADDRESS ______
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code
3. DATE DRILLED 2-18-97 USE OF WELL ______
4. TOTAL DEPTH 54.0
5. CUTTINGS COLLECTED YES ☐ NO ☑
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0 To 44.0 Ft.		4"	SCH 10	S.S
From ______ To ______ Ft.			–	–
From ______ To ______ Ft.				

13. GROUT:

Depth	Material	Method
From 0.0 To 40.0 Ft.	PORTLAND	BUR
From ______ To ______ Ft.		

14. SCREEN:

Depth	Diameter	Slot Size	Material
From 44.0 To 54.0 Ft.	4" in.	.010 in.	S.S
From ______ To ______ Ft.	in.	in.	
From ______ To ______ Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth	Size	Material
From 42.0 To 54.0 Ft.	#2	SILICA SAND
From ______ To ______ Ft.		

16. REMARKS: ______

DRILLING LOG

DEPTH From	To	Formation Description
0	10	RED SILTY CLAY
10	20	" "
20	30	" "
30	40	" "
40	54	

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

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[signature]
SIGNATURE OF CONTRACTOR OR AGENT

3-12-97
DATE

Submit original to Division of Environmental Management and copy to well owner

GW-1 REV. 9/91

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Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: SAEDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ______

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: WARRENTON County: ______ OSW-2
   LIMER TOWN RD
   (Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LAND FILL
   ADDRESS ______
   (Street or Route No.)
   WARRENTON NC
   City or Town State Zip Code
3. DATE DRILLED 2-17-96 USE OF WELL MONITOR
4. TOTAL DEPTH 43.5
5. CUTTINGS COLLECTED YES ☐ NO ☑
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______
12. CASING:

Depth From	To		Diameter	Wall Thickness or Weight/Ft.	Material
0.0	33.5	Ft.	4"	SCH 10	S.S
		Ft.			
		Ft.			

13. GROUT:

Depth From	To		Material	Method
0.0	29.0	Ft.	PORTLAND	TRIMMY
		Ft.		

14. SCREEN:

Depth From	To		Diameter		Slot Size		Material
33.5	43.5	Ft.	4"	in.	.010	in.	S.S
		Ft.		in.		in.	
		Ft.		in.		in.	

15. SAND/GRAVEL PACK:

Depth From	To		Size	Material
31.5	43.5	Ft.	#2	SILICA SAND
		Ft.		

16. REMARKS: BENTONITE 29.0 — 31.5

DRILLING LOG

DEPTH From	To	Formation Description
0	5	RED. SILTY CLAY
5	10	" "
10	15	" "
15	25	" "
25	35	
35	43.5	"

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature]
SIGNATURE OF CONTRACTOR OR AGENT

3-12-97
DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

WELL CONSTRUCTION RECORD

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

DRILLING CONTRACTOR: SABDACCO

DRILLER REGISTRATION NUMBER: 1021

STATE WELL CONSTRUCTION PERMIT NUMBER: ______

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: WARRENTON County: ______
LIMER TOWN RD
(Road, Community, or Subdivision and Lot No.)
2. OWNER WARREN CO. PCB LANDFILL
ADDRESS LIMER TOWN RD
(Street or Route No.)
WARRENTON NC
City or Town State Zip Code
3. DATE DRILLED 2-13-97 USE OF WELL MONITOR
4. TOTAL DEPTH 42.0
5. CUTTINGS COLLECTED YES ☐ NO ☑
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☑
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.5 FT. Above Land Surface*
*Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): ______ METHOD OF TEST ______
10. WATER ZONES (depth): ______
11. CHLORINATION: Type ______ Amount ______

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0	10	RED SILTY CLAY
10	20	" "
20	25	" "
25	35	PWR/MICA WEATHERED R.
35	42	" "

If additional space is needed use back of form

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 32.0	Ft.	4"	SCH 10	S.S
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 1.0	To 28.0	Ft.	PORTLAND	TRIMMY
From	To	Ft.		

14. SCREEN:

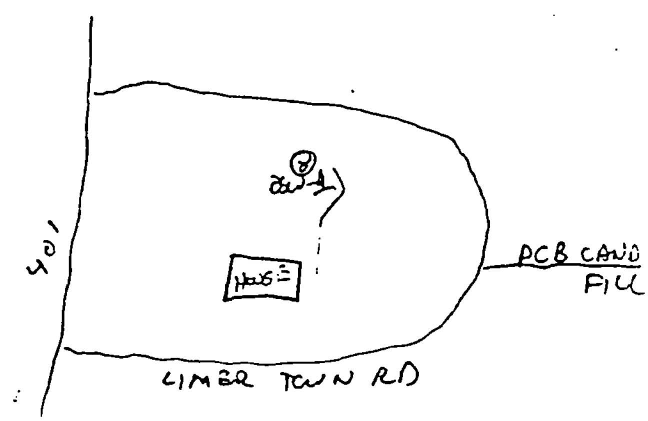
	Depth		Diameter	Slot Size	Material
From 32.0	To 42.0	Ft.	4" in.	.010 in.	S.S
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 30.0	To 42.0	Ft.	# 2	SILICA SAND
From	To	Ft.		

16. REMARKS: BENTONITE 28.0 — 30.0

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)



I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT

2-15-97
DATE

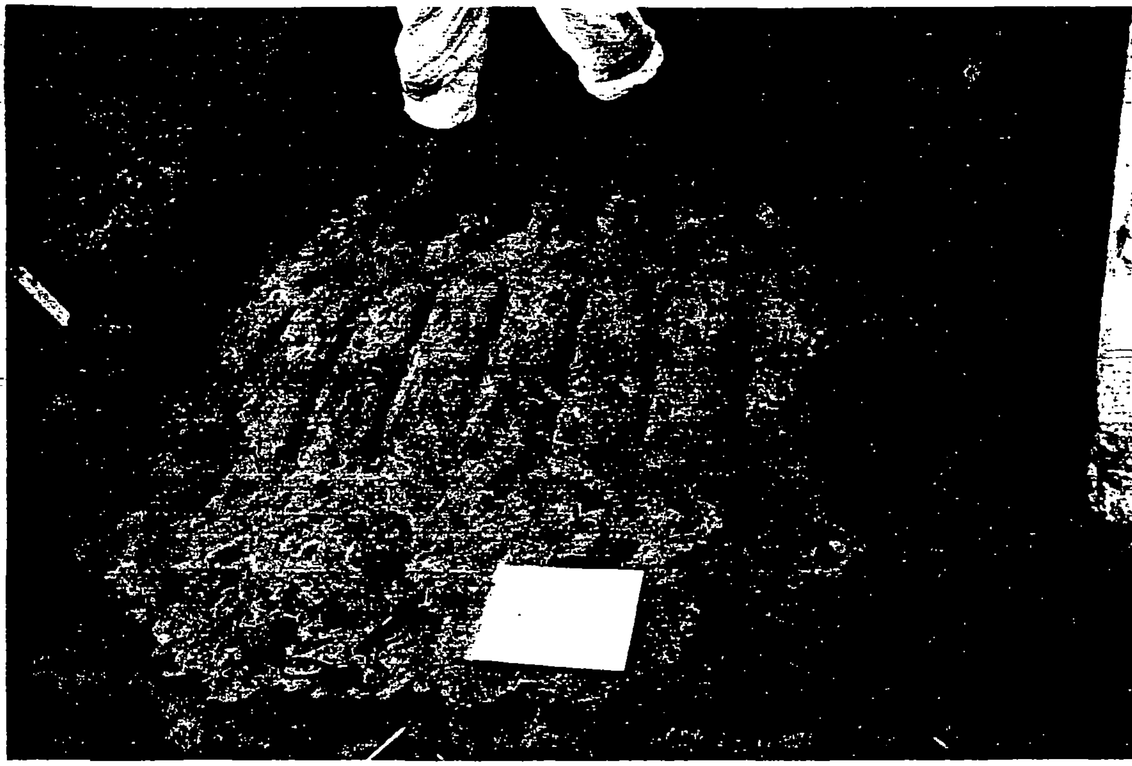
GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner

Appendix 9
Monitoring Well Installation Report

7.

Worker patches liner section removed.
Notice wrinkles in the foreground.



5.

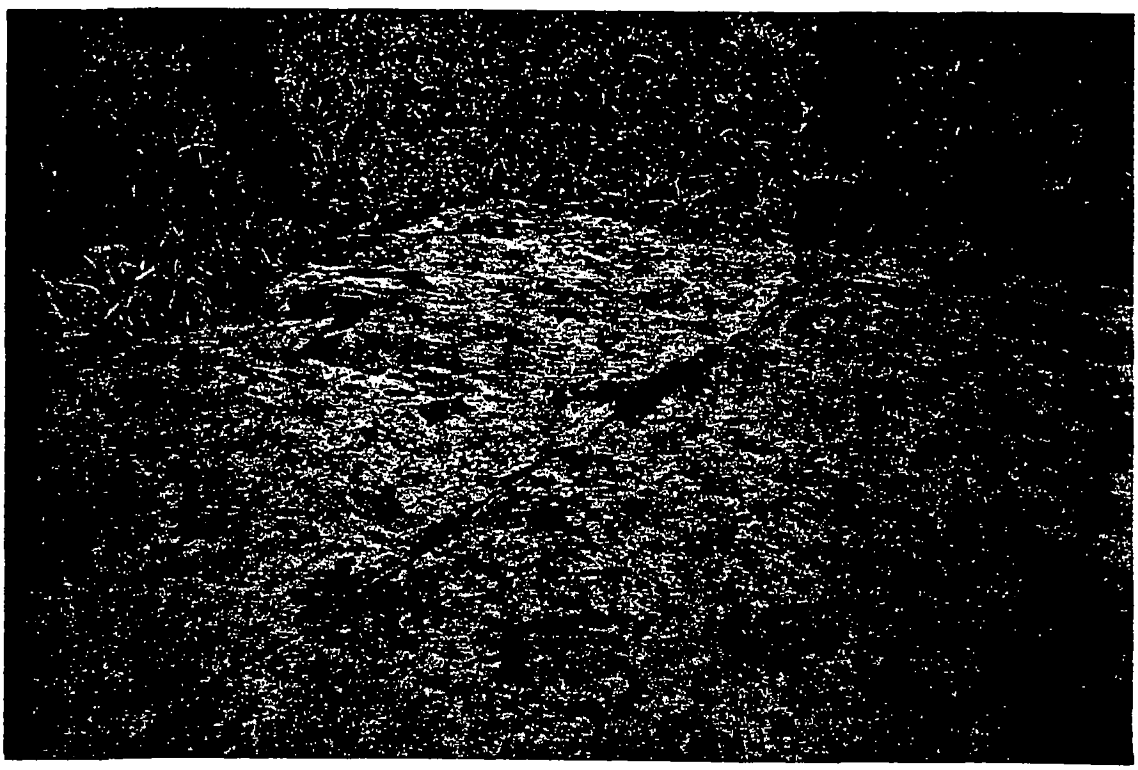
Trackhoe marks are a strong indication of improper QA/QC during liner construction.

6.

Worker shows lack of adhesive on a segment of liner seam. (South Excavation)

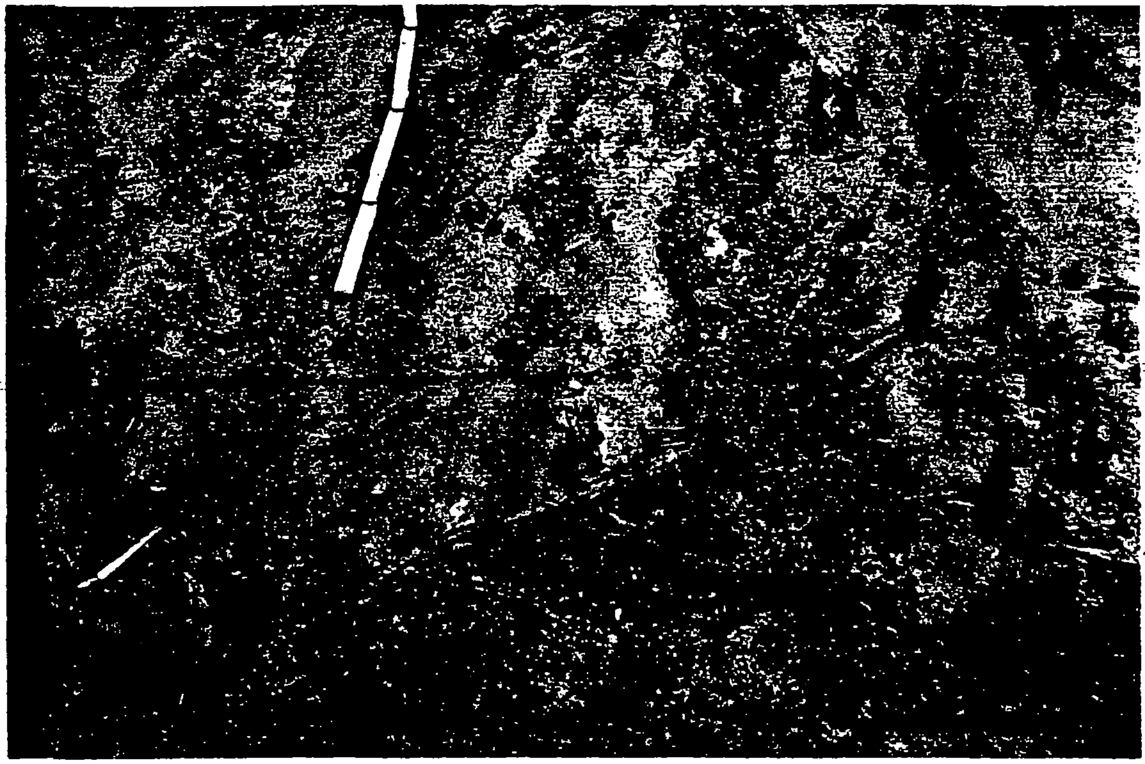
3.

Grass roots can be seen growing through the liner material.



4.

Underside of PVC liner shows extensive root penetration.



1.

Extensive root activity at the base of the landfill cover.
(North Excavation)

2.

Picture shows two large holes in PVC liner materials. The wrinkles in the PVC clearly show poor installation.
(North Excavation)

WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Atkinson Well #: 55

Comments (well construction, etc):

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 1.04 3 Well Volumes (gal): 3.2 Purge Equipment: Bailer

Date Purged: 4-7-97 Purge Time Start: 1400 Purge Time End: 14:50

Did well purge dry? Y N Actual purge volume: 3.2 gal.

	Volume 0	Volume 1	Volume 2	Volume 2.5	Volume 3	Volume ___
Temp (°C)	12.0	12.1	12.50	11.80	12.1	
pH	6.06	5.19	5.88	5.51	5.35	
S. C.	77.8	73.1	81.2	79.1	74.9	
D. O.	1.5					
Turbidity	306	818	615	1125	1105	

Sample Information

Sample Date: 4/7/97 Sample Time: 2010 Sample Equipment: Sub. Pump w/ Teflon Tubing
~~Sample Date: 4/8/97 Sample: 0920 Sample Equip. Bailer~~
Water Condition (turbidity, odor, etc.):

Note: Well Sampled through Grundfos Pump supplied By EPA 1A106003

Samples Collected (✓):

___ VOCs (2 40 ml vials) ___ Dioxin (1 1L bottle)

___ SVOCs/PCBs (1 2L Amber bottle) ___ Pest./Herb. (1 2L amber bottle)

___ Metals (1 1L HDPE bottle)

Temp(°C): 19.9 pH: 5.7 SC(umhos): 66 DO(ppm): 4.7 Turb(NTUs): 10.1
18.9

Comments:

pcbwells.frm

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Atkinson Well #: 5 D

Comments (well construction, etc):

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
~~For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)~~
For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 4.155 3 Well Volumes (gal): 12.75 Purge Equipment: Bailer

Date Purged: 4/7/97 Purge Time Start: 15:15 Purge Time End: 16:05

Did well purge dry? Y N Actual purge volume:

	Volume 0	Volume 1	Volume 2	Volume 2.5	Volume 3	Volume __
Temp (°C)	13.5	12.1	12.1	11.9	11.9	
pH	6.57	5.23	5.00	4.98	4.93	
S. C.	87.1	72.3	79.5	75.3	78.4	
D. O.	—	—	—	—	4.6	
Turbidity	8.90	37.0	52	41	38.3	

Sample Information

Sample Date: 4/7/97 Sample Time: 16:30 Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.):

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle)

___ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 11.9 pH: 4.93 SC(umhos): 78.4 DO(ppm): ___ Turb(NTUs): 38.3

Comments:

pcbwells.frm

WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rumford/Harris-Bishop Well #: MW-6

Comments (well construction, etc): Depth of Well 59.78' Stickup 0.79 Depth to Water 20.02 Standing Water 39.76'

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

Purge Information

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 6.25 3 Well Volumes (gal): 18.75 Purge Equipment: Peristaltic Pump w/ Teflon Tubing

Date Purged: 4/8/97 Purge Time Start: 1030 Purge Time End: 1300

Did well purge dry? Y (N) Actual purge volume: 19 gallons

Initial	Volume 1 (1115)	Volume 2 (1200)	Volume 2.5 (1225)	Volume 3 (1240)	Volume ___	Volume ___
Temp (°C) 16.3	17.4	19.1	17.2	17.8		
pH 6.49	6.23	6.36	6.40	6.33		
S. C. 20	37	37	35	39		
D. O. 3.5	2.29	2.4	2.59	2.60		
Turbidity 20	13.5	4.29	3.00	2.37		

Flow Rate 1 gallon per 6.5 minutes

Sample Information

Sample Date: 4/8/97 Sample Time: 1300 Sample Equipment: Peristaltic w/ teflon tubing & bottle cap apparatus

Water Condition (turbidity, odor, etc.): Clear

Samples Collected (✓):

___ VOCs (2 40 ml vials) ___ Dioxin (1 1L bottle)

___ SVOCs/PCBs (1 2L Amber bottle) ___ Pest./Herb. (1 2L amber bottle)

___ Metals (1 1L HDPE bottle)

Temp(°C): 17.8 pH: 6.33 SC(umhos): 3.9 DO(ppm): 2.60 Turb(NTUs): 2.37

Comments: Sample time ~ 40 minutes.

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Stanley Well #: MW-7S

Comments (well construction, etc): Well depth 37.00 ft

4.73 ft standing wtr.

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 0.8 3 Well Volumes (gal): 2.4 Purge Equipment: Bailer

Date Purged: 4/8/97 Purge Time Start: 2:45pm Purge Time End: 1st 3:15pm

Did well purge dry? Y N Actual purge volume: 1st = 5.0 gal

	Volume 0	Volume 1	Volume 2	Volume 3	Volume __	Volume __
Temp (°C)	13.1	12.6	12.2	12.1		
pH	5.42	5.58	5.61	5.63		
S. C.	69.3	60.4	58.3	58.1		
D. O.						
Turbidity	91.4	455.0	861.0	1118.0		

Sample Information

Sample Date: 4/8/97 Sample Time: 1650 Sample Equipment: Sub. Pump w/ Teflon Tubing

Water Condition (turbidity, odor, etc.): ______

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Metals (1 1L HDPE bottle)

✓ Dioxin (1 1L bottle) 2

✓ Pest./Herb. (1 2L amber bottle)

Temp(°C): 21.5 pH: 5.86 SC(umhos): 67 DO(ppm): 3.7 Turb(NTUs): 336

Comments: ______

WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Stanley / Rose Well #: MW-8

Comments (well construction, etc): Well Depth 51.5 ft

25 feet Standing Wtr.

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

Purge Information

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 4.2 3 Well Volumes (gal): 12.5 Purge Equipment: Bailer

Date Purged: 4/8/97 Purge Time Start: 4:55pm Purge Time End: 5:25pm

Did well purge dry? Y N Actual purge volume: ~18 gal

Water Very Turbid

	Volume ___	Volume ___	Volume ___	Volume ___	Volume ___	Volume ___
Temp (°C)						
pH						
S. C.						
D. O.						
Turbidity						

Sample Information

Sample Date: 4/9/97 Sample Time: 10:25am Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.): Turbidity after VOC's = 22.4

After Dioxin ≈ 200 (Dioxin sample discarded)

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

___ Dioxin (1 1L bottle)

___ SVOCs/PCBs (1 2L Amber bottle)

___ Pest./Herb. (1 2L amber bottle)

___ Metals (1 1L HDPE bottle)

Temp(°C): 20 pH: 5.91 SC(umhos): 57 DO(ppm): 5.18 Turb(NTUs): 66

Comments: Remaining Samples Collected 4/9/97 @ 1330

Water Appears To Be more Cloudy Than Turbide

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WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: ROBERTS/STEPHENS Well #: #9

Comments (well construction, etc): DUPLICATES

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet) 10.
~~For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)~~
For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 1.6 gal 3 Well Volumes (gal): 5 GALS Purge Equipment: PERISTALTIC

Date Purged: 4/8/97 Purge Time Start: 1410 Purge Time End: 14:55

Did well purge dry? Y N Actual purge volume: 5.5 gal

(SEE BELOW ALSO)

	Volume 1	Volume 2	Volume 2 1/2	Volume 3	~~Volume~~ AFTER SAMPLE COLLECTION	Volume
Temp (°C)	12.9	13.0	/	12.9	13.5	
pH	5.15	5.35	/	5.42	5.60	
S. C.	110	105	/	99	96	
D. O.	3.1	3.5	/	3.5	4.1	
Turbidity	50	51	30	~~[illegible]~~ 8	9.3	

(GBS 4/8/97)

Sample Information

Sample Date: 4/8/97 Sample Time: 1500 Sample Equipment: PERISTALTIC

Water Condition (turbidity, odor, etc.):

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Metals (1 1L HDPE bottle)

✓ Dioxin (1 1L bottle)

✓ Pest./Herb. (1 2L amber bottle)

Temp(°C): 13.5 pH: 5.60 SC(umhos): 96 DO(ppm): 4.1 Turb(NTUs): 9.3

Comments: TURBIDITY METER CALIBRATED WITH 0.02 - READ 0.05
FIELD PARAMETER TAKEN THROUGH COLLECTION BOTTLE PROBABLY
CAUSING ELEVATED TEMPERATURE DUE TO RETENTION IN COLLECTIO

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WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: MOORE/STANLEY (TEAM 4) Well #: MW-10S

Comments (well construction, etc): ______

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 2.472 (10 bailers) 3 Well Volumes (gal): 7.415 (30 bailers) Purge Equipment: Peristaltic Pump

Date Purged: 4/7/97 Purge Time Start: 12:05 Purge Time End: 13:45

Did well purge dry? Y (N) Actual purge volume: ______

	0	12:20	12:35	12:42	12:50	1500-at sample
	Volume 0	14.8 mins Volume 1	30 mins Volume 2	37 mins Volume 2½	45 mins Volume 3	Volume ___
Temp (°C)	15.4	15.2	15.0	14.9	14.9	15.0
pH	6.83	4.65	6.61	6.61	6.49	6.67
S. C.	54.2	71.7	46.6	47.2	47.6	58.3
D. O.	2.9 ppm	3.0 ppm	3.0 ppm	3.0 ppm	3.0 ppm	3.3
Turbidity	2.0 NTU	2.0 NTU	1.0 NTU	2.0 NTU	0.0 NTU	1.0

Sample Information

Sample Date: 4/7/97 Sample Time: 1505 Sample Equipment: peristaltic pump

Water Condition (turbidity, odor, etc.): clear, no odor

Samples Collected (✓):

2 VOCs (2 40 ml vials)

1 SVOCs/PCBs (1 2L Amber bottle)

1 Metals (1 1L HDPE bottle)

2 Dioxin (1 1L bottle)

1 Pest./Herb. (1 2L amber bottle)

Temp(°C): 15.0 pH: 6.67 SC(umhos): 58.3 DO(ppm): 3.3 Turb(NTUs): 1.0

Comments: ______

pchwells.frm

WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: MOORE/STALEY (TEAM 4) Well #: MW-10D

Comments (well construction, etc):

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
~~For bailers: 4 bails = 1 gallon~~

1 Well Volume (gal): 12.038 (48 bailers) 3 Well Volumes (gal): 36.115 (145 bailers) Purge Equipment: Peristaltic Pump

Date Purged: 4/7/97 Purge Time Start: 11:25 Purge Time End: 1510

Did well purge dry? Y (N). Actual purge volume:

	Volume 0	12:37 72 mins. Volume 1	13:49 144 mins Volume 2	14:25 180 Volume 2½	15:01 216 mins Volume 3	Volume __
Temp (°C)	16.3	15.2	15.6	15.6	15.7	
pH	7.23	7.23	7.02	7.25	7.34	
S. C.	127.4	97.4	104.5	105.6	100.5	
D. O.	3.4 ppm	3.7 ppm	2.2 ppm	3.4	4.2	
Turbidity	3 NTU	6.0 NTU	1.0	1.0	0	

Sample Information

Sample Date: 4/7/97 Sample Time: 1520 Sample Equipment: peristaltic pump

Water Condition (turbidity, odor, etc.): clean, no odor

Samples Collected (✓):

2 VOCs (2 40 ml vials)

1 SVOCs/PCBs (1 2L Amber bottle)

1 Metals (1 1L HDPE bottle)

2 Dioxin (1 1L bottle)

1 Pest./Herb. (1 2L amber bottle)

Temp(°C): 15.7 pH: 7.34 SC(umhos): 100.5 DO(ppm): 4.2 Turb(NTUs): 0

Comments: purged w/ peristaltic pump

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WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rumford / Harris-Bishop Well #: MW-11

Comments (well construction, etc): Depth of well 42.36'; Depth to Water 35.86'
Standing Water 6.5'

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 1 3 Well Volumes (gal): 3 gal Purge Equipment: Bailer

Date Purged: 4/9/97 Purge Time Start: 1045 Purge Time End: 1121

Did well purge dry? Y (N) Actual purge volume: 3 gal

	Volume Initial	1105 Volume 1	1112 Volume 2	1121 Volume 3	Volume __	Volume __
Temp (°C)	15.6	15.8	15.9	15.8		
pH	5.95	5.68	5.62	5.63		
S. C.	54	69	74	70		
D. O.	5.5	6.0	6.3	6.2		
Turbidity	311	>1000	>1000	>1000		

Sample Information

Sample Date: 4/9/97 Sample Time: 1720 Sample Equipment: VoAs - Bailer Others - Sub Pump w/ Teflon tube

Water Condition (turbidity, odor, etc.): Sample turbidity ~ 70 NTU took add'l VoA w/ Pump, since Turbidity lower.

Samples Collected (✓):

✓ VOCs (2 40 ml vials) (4)

___ Dioxin (1 1L bottle)

___ SVOCs/PCBs (1 2L Amber bottle)

___ Pest./Herb. (1 2L amber bottle)

___ Metals (1 1L HDPE bottle)

Temp(°C): 18.7 pH: 5.81 SC(umhos): 63 DO(ppm): 4.9 Turb(NTUs): 93

Comments: Left well @ 1130 to settle. Very muddy, turbid well. Turbidity going up as sampling continued. Cloudy / turbid.

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WELL LOG SHEET Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Stanley Well #: MW-12

Comments (well construction, etc): Well depth 38.40 Depth to Wtr = 27.88

Standing Wtr. = 10.52 ft.

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

Purge Information

1 Well Volume (gal): 1.75 3 Well Volumes (gal): 5.26 Purge Equipment: Bailer

Date Purged: 4/9/97 Purge Time Start: 11:10 am Purge Time End: 12 noon

Did well purge dry? Y (N) Actual purge volume: 5.5 gal

	Volume 0	Volume 1	Volume 2	Volume 2 1/2	Volume 3	Volume __
Temp (°C)	12.1	11.7	11.7	11.3	11.1	
pH	5.78	5.72	5.68	5.68	5.62	
S. C.	74.7	86.2	88.2	85.3	88.1	
D. O.						
Turbidity	3.1	32.5	57.3	46.6	41.5	

Sample Information

Sample Date: 4/9/97 Sample Time: 12:05 pm Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.): Turbidity @ VOC bailer 15.5; Turbidity after SVOC #1 ≈ 10.5; Turbidity after SVOC #2 ≈ 6.9; Turbidity after metals ≈ 9.95

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Metals (1 1L HDPE bottle)

✓ Dioxin (1 1L bottle)

✓ Pest./Herb. (1 2L amber bottle)

Temp(°C): 11.4 pH: 5.77 SC(umhos): 83.0 DO(ppm): ____ Turb(NTUs): 9.95

Comments: Above parameters after last sample (metals).

Sampling concluded @ 12:30 pm.

WELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Stanley Well #: MW-7d

Comments (well construction, etc): Well depth 47.54 ft.

Depth to wtr. 32.68 ft. 14.86 ft Standing Water

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)

Purge Information

For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)

For bailers: 4 bails = 1 gallon

1 Well Volume (gal): 2.48 3 Well Volumes (gal): 7.43 Purge Equipment: Bailer

Date Purged: 4/8/97 Purge Time Start: 3:25pm Purge Time End: 4:51pm

Did well purge dry? Y (N) Actual purge volume: 9.91 gal.

	Volume 0	Volume 1	Volume 2	Volume 2 1/2	Volume 3	Volume 3 1/2	Vol. 4
Temp (°C)	12.9	12.7	12.3	12.5	12.3	12.2	12.3
pH	5.96	5.87	5.81	5.80	5.86	5.95	5.93
S. C.	54.9	57.9	60.9	59.9	60.5	61.9	59.9
D. O.							
Turbidity	3.31	101.2	221.0	212.0	211.0	210.0	211.0

Sample Information

Sample Date: 4/9/97 Sample Time: 10:01 am Sample Equipment: Bailer

Water Condition (turbidity, odor, etc.): See attached sheet

Samples Collected (✓):

✓ VOCs (2 40 ml vials)

✓ Dioxin (1 1L bottle)

✓ SVOCs/PCBs (1 2L Amber bottle)

✓ Pest./Herb. (1 2L amber bottle)

✓ Metals (1 1L HDPE bottle)

Temp(°C): 12.3 pH: 6.02 SC(umhos): 57.6 DO(ppm): – Turb(NTUs): 25.8

Comments: Above parameters after last sample (metals)

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ELL LOG SHEET

Facility: Warren County PCB Landfill Location: Warrenton

Purge/Sample Team: Rose / Stanley Well #: MW-7d

Comments (well construction, etc):

Purge Information

Conversion Factors: For 2" well: 3 volumes (gallons) = 0.5 x height of water column (feet)
For 4" well: 3 volumes (gallons) = 2.0 x height of water column (feet)
For bailers: 4 bails = 1 gallon

1 Well Volume (gal): ______ 3 Well Volumes (gal): ______ Purge Equipment: ______

Date Purged: ______ Purge Time Start: ______ Purge Time End: ______

Did well purge dry? Y N Actual purge volume: ______

	After VOC	After Dioxine	After SVOC 1	After SVOC 2	After Metals	
	Volume ___	Volume ___	Volume ___	Volume ___	Volume ___	Volume ___
Temp (°C)	12.6				12.3	
pH	5.72				6.02	
S. C.	68.9				57.6	
D. O.						
Turbidity	6.94	10.75	30.75	29.8	25.8	

Sample Information

Sample Date: ______ Sample Time: ______ Sample Equipment: ______

Water Condition (turbidity, odor, etc.): ______

Samples Collected (✓):

___ VOCs (2 40 ml vials)

___ SVOCs/PCBs (1 2L Amber bottle)

___ Metals (1 1L HDPE bottle)

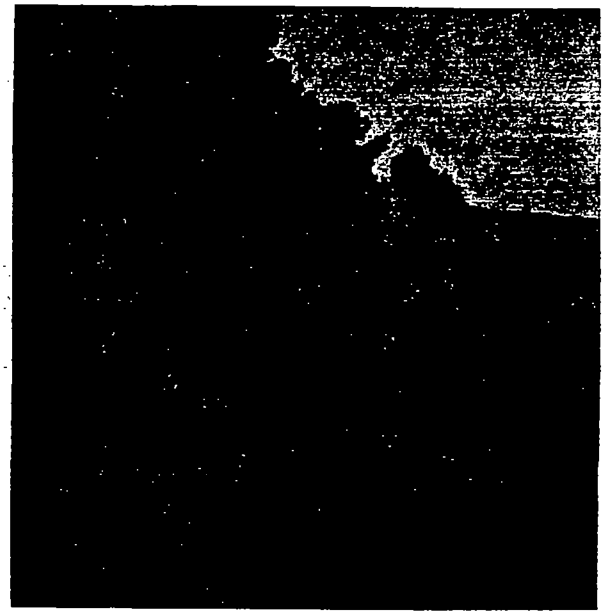
___ Dioxin (1 1L bottle)

___ Pest./Herb. (1 2L amber bottle)

Temp(°C): ______ pH: ______ SC(umhos): ______ DO(ppm): ______ Turb(NTUs): ______

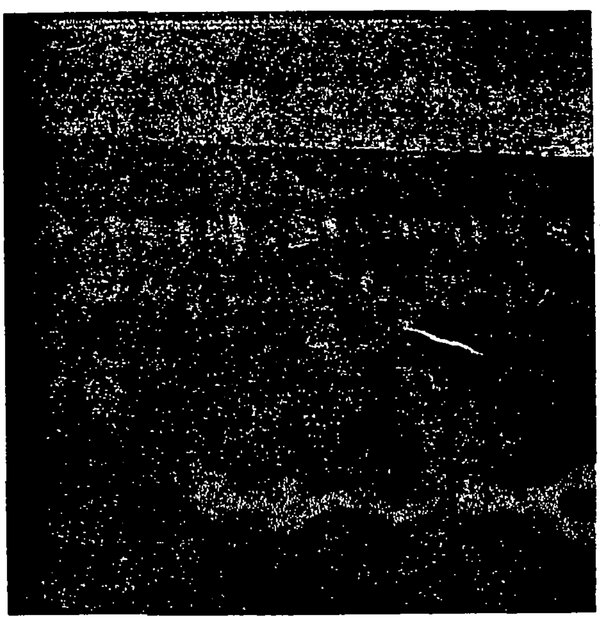
Comments: Above parameters taken during sample collection with bailer. See page 1.

Appendix 11
Pictures of Landfill Construction

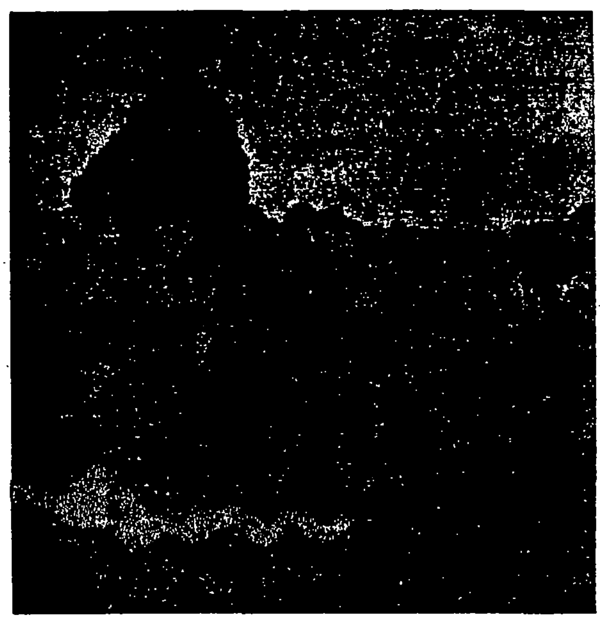


1.

VANDALISM OF BOTTOM SYNTHETIC LINER



2.



3.

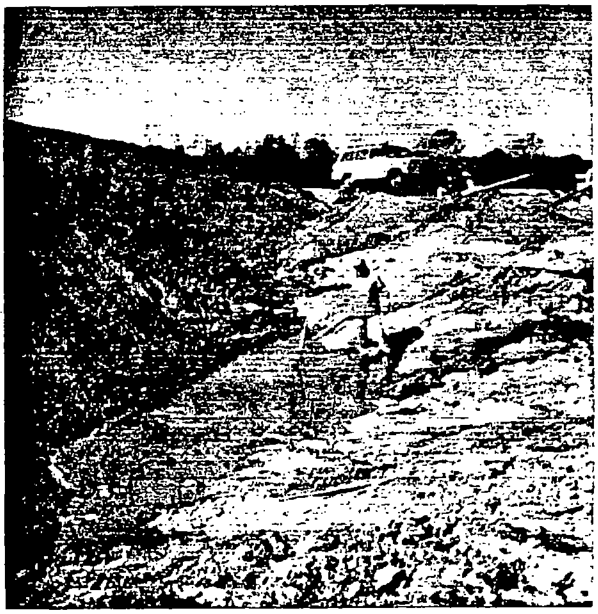
4.

5.

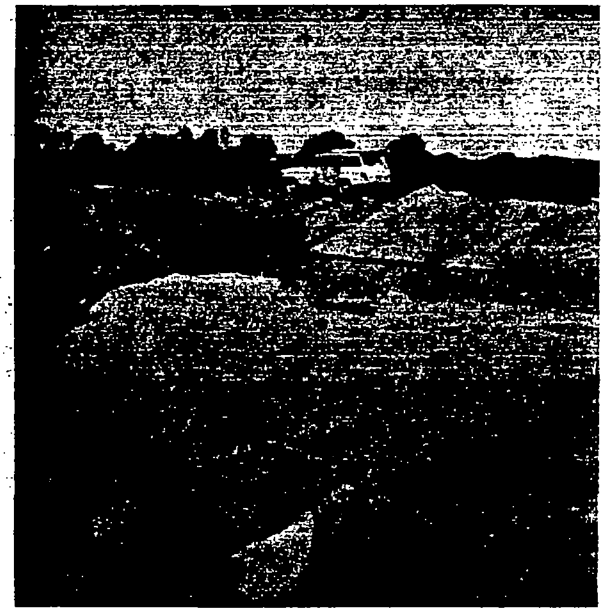
CONTAMINATED SOIL PLACEMENT AND TOP SYNTHETIC LINER INSTALLATION

6.

7.



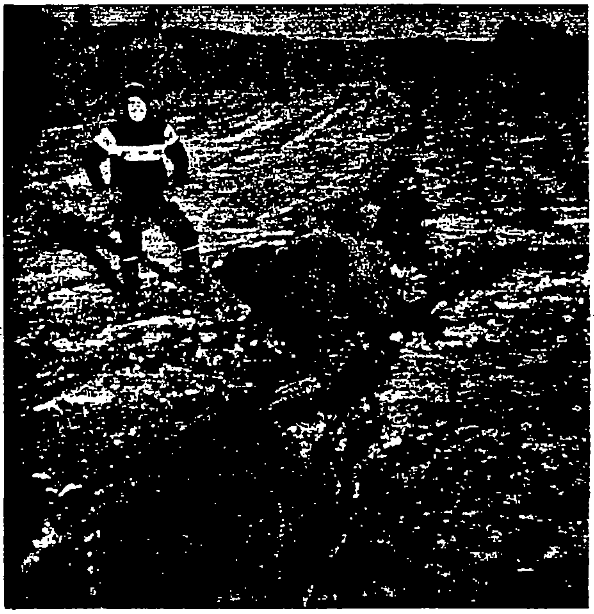
8.



9.

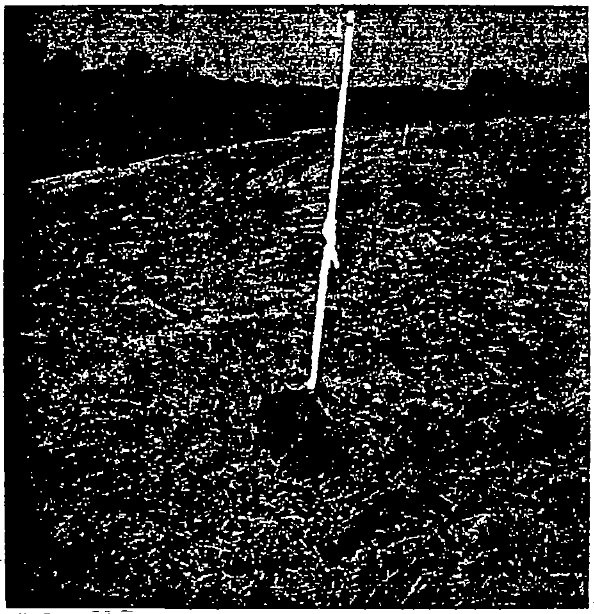
STORMWATER DAMAGE DURING CONSTRUCTION ACTIVITIES

10.



11.

STORMWATER DAMAGE LEADS TO LINER EXPOSURE; METHANE GAS BUILD-UP IS RELEASED BY PIERCING BUBBLES



12.

Appendix 12
PCB, Dioxin/Furan, BNAE and VOC Analytical Results

Summary of dioxins and furans detected, Warren County Landfill, NC

		TOTAL				
		TEF-Adj.	Total	Total	Total	
Code	**Identification**	Concent.	PeCDDs	HxCDDs	HpCDDs	OCDD
QA/QC	pg/L					
ADF	Blank	**6.997E-02**			**3.051**	**20.430B**
MB	Blank	**1.009E-01**			**11.299**	**39.624B**
CBT	Blank	**1.070E-02**				**10.695B**
~~KTB~~	~~Blank~~	~~**1.010E-01**~~			~~**7.200**~~	~~**25.564B**~~
TB	Blank	**5.312E-01**			**18.837**	**357.636B**
JD	Blank	**8.685E-02**			**4.516**	**41.691B**
Stream Sediment	ng/Kg					
BHB	Sed. 1	**4.854E-02**			**3.818**	**26.339B**
CB	Sed. 2	**1.531E-01**			**2.347**	**125.418B**
MS	Sed. 3	**8.586E-02**			**2.998**	**69.565B**
MR	Sed. 4	**4.417E-02**			**1.728**	**34.953B**
AR+	Sed. 5	**1.647E-01**			**4.887**	**137.462B**
NCB	Sed. 6	**8.305E-02**		**0.371**	**3.505**	**62.329B**
SD	Sed. 7	**8.591E-02**		**0.656**	**4.847**	**54.510B**
PJR Above Br	RCUS	**5.967E-02**			**1.463**	**45.258B**
CD Below B	RCUS	**1.502E-02**			**5.027**	**124.561B**
Background Surface Soils	ng/Kg					
TMSS	OSW-3	**5.920E-01**			**9.823**	**546.099B**
LESS	OSW-2	**2.615E-01**				**244.902**
HESS	OSW-4	**4.542E-01**			**2.160**	**432.600**
Surface Water	pg/L					
RSB	SW-1	**2.230E-02**				**22.301B**
KB	UTDS	**8.941E-02**				**56.328B**
IMB	UTUS	**4.380E-02**				**43.800B**
ISB	RCDS	**4.904E-02**				**49.044B**
DA Above	RCUS	**5.175E-02**				**51.753B**
CA Below	RCUS	**5.195E-02**				**51.948B**
DJ+	SW-2	**2.414E-02**				**24.139B**
Well Boring Soils	**ng/Kg**					
PMB	Davis-BG	**3.175E-02**			**0.572**	**24.152B**
HM	MW-7	**1.796E-03**				**1.796B**
WM	MW-11	**6.366E-03**				**1.017B**
KM	MW-1	**3.888E-03**				**1.391B**
DM	MW-12	**2.651E-03**				**2.651B**
MM	MW-5	**2.641E-03**				**2.641B**
Landfill Soils	**ng/Kg**					
JABT* TOP	North Boring	**2.796E+01**			**43.222**	**788.850B**
JABB* MIDDLE	North Boring	**4.289E+01**			**158.870**	**1657.170B**
JABP* BOTTOM	North Boring	**3.446E+00**			**28.407**	**248.941B**
NIAT* TOP	South Boring	**1.244E+02**				**218.649B**
NIAB* MIDDLE	South Boring	**2.533E-01**			**4.204**	**76.836B**
NIAP* BOTTOM	South Boring	**6.564E+01**			**20.892**	**696.972B**

Summary of dioxins and furans detected, Warren County Landfill, NC

		TOTAL TEF-Adj.	Total	Total	Total	
Code	**Identification**	Concent.	PeCDDs	HxCDDs	HpCDDs	OCDD
DMA	SEEP	**5.786E-02**			**1.080**	**47.030**
SLB+ Pond	3	**1.050E-01**			**3.480**	**83.466B**
AB Pond	2	**1.050E-01**			**3.218**	**86.271B**
LB+ Pond	1	**5.483E-02**			**2.970**	**31.231B**
PJD	Sand Filter	**1.235E-01**			**5.196**	**52.6B**
ADD	Carbon Filter	**1.604E-02**				**5.994B**
Landfill Leachate	pg/L					
QAR+	no. well (inlet)				**181.003**	**1407.174B**
EZM	outlet				**6.485**	**41.023XB**
NOV	south well				**20.098**	**540.736B**
Groundwater	**pg/L**					
BB	MW-1	**1.526E-01**			**6.770**	**48.690**
JDH	MW-1A	**3.705E+01**	**3.428**	**178.710**	**2072.781**	**626.827B**
ALB	MW-2	**5.052E-02**			**2.870**	**21.820**
RPAB	MW-3A (D)	**2.054E-01**			**17.178**	**97.746B**
RBAB+ Exist.	MW-3 S	**7.895E-02**			**3.945**	**18.232B**
RPF Exist.	MW-4	**2.111E-02**				**21.108B**
JDW	MW-4A	**7.905E-02**			**5.767**	**21.511B**
CEH	MW-5S	**5.545E-02**			**3.880**	**16.690**
PSG	MW-5D	**2.412E+01**			**4.593**	**31.639B**
JOK	MW-6	**1.809E-02**				**18.087BX**
MMM	MW-7S	**5.060E-02**			**2.129**	**14.057B**
BT	MW-7D	**8.812E-02**			**3.200**	**17.640**
CC	MW-8	**2.232E-01**			**7.520**	**99.020**
ADJ/JDA	MW-9	**2.271E-01**			**10.360**	**87.530**
RDRJ	MW-10S	**8.626E-02**			**4.947**	**16.819B**
RAJR	MW-10D	**1.044E-01**			**4.518**	**30.483B**
AJ	MW-11	**1.638E-01**			**7.490**	**54.260**
ASH	MW-12	**1.309E-02**				**13.090**
DRK OSW-2	Alston-BG	**2.936E-02**				**29.360**
RRAM OSW4	O'Neal-BG	**1.963E-02**				**19.627BX**
+RPS OSW-3	Davis-BG	**1.008E-01**			**7.379**	**36.990B**

Summary of dioxins and furans detected, Warren County Landfill, NC

Code		Identification	Total TCDFs	Total PeCDFs	Total HxCDFs	Total HpCDFs
QA/QC		pg/L				
ADF		Blank				**1.903**
MB		Blank				
CBT		Blank				
KTB		Blank				
TB		Blank				
JD		Blank				
Stream Sediment		ng/Kg				
BHB		Sed. 1				
CB		Sed. 2				**0.421**
MS		Sed. 3				
MR		Sed. 4				
AR+		Sed. 5				
NCB		Sed. 6				**0.472**
SD		Sed. 7				**0.679**
PJR Above Br		RCUS				**0.256**
CD Below B		RCUS				**0.299**
Background Surface Soils		ng/Kg				
TMSS		OSW-3				
LESS		OSW-2				
HESS		OSW-4				
Surface Water		pg/L				
RSB		SW-1				
KB		UTDS				
IMB		UTUS				
ISB		RCDS				
DA Above		RCUS				
CA Below		RCUS				
DJ+		SW-2				
Well Boring Soils		**ng/Kg**				
PMB		Davis-BG				**0.201**
HM		MW-7				
WM		MW-11				**0.240**
KM		MW-1				**0.240**
DM		MW-12				
MM		MW-5				
Landfill Soils		**ng/Kg**				
JABT*	TOP	North Boring		**64.370**	**126.550**	**441.472**
JABB*	MIDDLE	North Boring	**82.014**	**261.791**	**167.251**	**254.157**
JABP*	BOTTOM	North Boring		**30.183**	**20.065**	**35.517**
NIAT*	TOP	South Boring	**167.189**	**284.922**	**321.045**	**1881.380**
NIAB*	MIDDLE	South Boring		**3.341**	**2.599**	**2.083**
NIAP*	BOTTOM	South Boring	**23.103**	**61.976**	**285.380**	**1054.536**

Summary of dioxins and furans detected, Warren County Landfill, NC

		Total	Total	Total	Total
Code	**Identification**	TCDFs	PeCDFs	HxCDFs	HpCDFs
DMA	SEEP				
SLB+ Pond	3				**0.243**
AB Pond	2				**0.502**
LB+ Pond	1				**0.910**
PJD	Sand Filter			**0.610**	**1.591**
ADD	Carbon Filter				**0.516**
Landfill Leachate	pg/L				
QAR+	no. well (inlet)		**14.917**	**41.777**	**94.990**
EZM	outlet				
NOV	south well		**45.563**	**54.339**	**197.224**
Groundwater	**pg/L**				
BB	MW-1			**3.290**	
JDH	MW-1A		**28.235**	**282.549**	**207.343**
ALB	MW-2				
RPAB	MW-3A (D)				
RBAB+ Exist.	MW-3 S				**2.127**
RPF Exist.	MW-4				
JDW	MW-4A				**3.264**
CEH	MW-5S				
PSG	MW-5D				
JOK	MW-6				
MMM	MW-7S				
BT	MW-7D				**3.850**
CC	MW-8				**4.120**
ADJ/JDA	MW-9				**3.040**
RDRJ	MW-10S				
RAJR	MW-10D				
AJ	MW-11		**3.470**		
ASH	MW-12				
DRK OSW-2	Alston-BG				
RRAM OSW4	O'Neal-BG				
+RPS OSW-3	Davis-BG				

Summary of dioxins and furans detected, Warren County Landfill, NC

Code		**Identification**	OCDF
QA/QC		pg/L	
ADF		Blank	
MB		Blank	
CBT		Blank	
KTB		Blank	**2.462B**
TB		Blank	**30.914B**
JD		Blank	
Stream Sediment		ng/Kg	
BHB		Sed. 1	
CB		Sed. 2	
MS		Sed. 3	
MR		Sed. 4	
AR+		Sed. 5	
NCB		Sed. 6	**0.280X**
SD		Sed. 7	**0.550**
PJR Above Br		RCUS	
CD Below B		RCUS	
Background Surface Soils		ng/Kg	
TMSS		OSW-3	
LESS		OSW-2	
HESS		OSW-4	
Surface Water		pg/L	
RSB		SW-1	
KB		UTDS	
IMB		UTUS	
ISB		RCDS	
DA Above		RCUS	
CA Below		RCUS	
DJ+		SW-2	
Well Boring Soils		**ng/Kg**	
PMB		Davis-BG	
HM		MW-7	
WM		MW-11	
KM		MW-1	**0.251**
DM		MW-12	
MM		MW-5	
Landfill Soils		**ng/Kg**	
JABT*	TOP	North Boring	**693.441**
JABB*	MIDDLE	North Boring	**469.346**
JABP*	BOTTOM	North Boring	**75.465**
NIAT*	TOP	South Boring	**2894.222**
NIAB*	MIDDLE	South Boring	**2.290**
NIAP*	BOTTOM	South Boring	**1414.418**

Summary of dioxins and furans detected, Warren County Landfill, NC

Code	**Identification**	OCDF
DMA	SEEP	
SLB+ Pond	3	**0.276**
AB Pond	2	**0.430**
LB+ Pond	1	**1.531**
PJD	Sand Filter	**2.595**
ADD	Carbon Filter	**0.362**
Landfill Leachate	pg/L	
QAR+	no. well (inlet)	**264.533**
EZM	outlet	**3.551**
NOV	south well	**387.675**
Groundwater	**pg/L**	
BB	MW-1	**4.350**
JDH	MW-1A	**626.827B**
ALB	MW-2	
RPAB	MW-3A (D)	**6.376XB**
RBAB+ Exist.	MW-3 S	
RPF Exist.	MW-4	
JDW	MW-4A	
CEH	MW-5S	
PSG	MW-5D	
JOK	MW-6	
MMM	MW-7S	
BT	MW-7D	
CC	MW-8	**7.740**
ADJ/JDA	MW-9	**5.650**
RDRJ	MW-10S	
RAJR	MW-10D	
AJ	MW-11	
ASH	MW-12	
DRK OSW-2	Alston-BG	
RRAM OSW4	O'Neal-BG	
+RPS OSW-3	Davis-BG	

Summary of extractables detected, Warren County Landfill, NC

			1,4-DCB	acenaph-thylene	phenan-threne	anthracene	fluor-anthene	pyrene	benz(a) anthracene
Code		**Identification**							
Landfill Soils		ug/Kg							
JABT*	TOP	North Boring			330 K		1067	800	
JABB*	MIDDLE	North Boring			330 K	330 K	9000	6433	12333
JABP*	BOTTOM	North Boring		330 K	1000	467	3233	3467	6167
NIAT*	TOP	South Boring	1967						
NIAB*	MIDDLE	South Boring							
NIAP*	BOTTOM	South Boring			67		1800	1833	

Summary of extractables detectea, Warren County Landfill, NC

		chrysene	benzo(b) fluoranthene
Code	**Identification**		
Landfill Soils	ug/Kg		
JABT* TOP	North Boring		
JABB* MIDDLE	North Boring	6600	5833
JABP* BOTTOM	North Boring	3800	1800
NIAT* TOP	South Boring		
NIAB* MIDDLE	South Boring		
NIAP* BOTTOM	South Boring		

Summary of pesticides, herbicides, and PCBs detected, Warren County Landfill, North Carolina.

Code	Identification	g-BHC (lindane)	chlordane	dieldrin	endrin	heptachlor	heptachlor epoxide	toxaphene	PCB	PCB-1260
Surface Water	**ppm**									
RSB	SW-1	NR	NA	NA	NA	NA	NA	NA		
KB	UTDS	NA	NA	NA	NA	NA	NA	NA		
IMB	UTUS	NA	NA	NA	NA	NA	NA	NA		
ISB	RCDS	NA	NA	NA	NA	NA	NA	NA		
DA Above	RCUS	NA	NA	NA	NA	NA	NA	NA		
CA Below	RCUS	NA	NA	NA	NA	NA	NA	NA		
DJ+	SW-2	NA	NA	NA	NA	NA	NA	NA		
Well Boring Soils	**ppm**									
PMB	Davis-BG	NA	NA	NA	NA	NA	NA	NA		
HM	MW-7			NR		NR	NR			
WM	MW-11			NR			NR			
KM	MW-1			NR			NR			
DM	MW-12			NR			NR			
MM	MW-5			NR			NR			
Landfill Soils	**ppm**									
JABT*	North Boring	NA	NA	NA	NA	NA	NA	NA	>>>	44.1
JABB*	North Boring	NA	NA	NA	NA	NA	NA	NA	>>>	90.3
JABP*	North Boring	NA	NA	NA	NA	NA	NA	NA	>>>	60.7
NIAT*	South Boring	NA	NA	NA	NA	NA	NA	NA	>>>	267.8
NIAB*	South Boring	NA	NA	NA	NA	NA	NA	NA	>>>	385.7
NIAP*	South Boring	NA	NA	NA	NA	NA	NA	NA	>>>	150.5
DMA	SEEP									
SLB+ Pond	3	NA	NA	NA	NA	NA	NA	NA		
AB Pond	2	NA	NA	NA	NA	NA	NA	NA		
LB+ Pond	1	NA	NA	NA	NA	NA	NA	NA		
PJD	Sand Filter		NR	NR		NR	NR			
ADD	Carbon Filter		NR	NR		NR	NR			

NA = not analyzed
NR = parameter not reported on State form
Blank Space = parameter run but not detected

BFA

Summary of pesticides, herbicides, and PCBs detected, Warren County Landfill, North Carolina.

Code	Identification	methoxy-chlor	2,4-D	2,4,5-TP	hexachloro benzene
Surface Water	**ppm**				
RSB	SW-1				
KB	UTDS				
IMB	UTUS				
ISB	RCDS				
DA Above	RCUS				
CA Below	RCUS				
DJ+	SW-2				
Well Boring Soils	**ppm**				
PMB	Davis-BG	NA	NA	NA	NA
HM	MW-7				NR
WM	MW-11				
KM	MW-1				
DM	MW-12				
MM	MW-5				
Landfill Soils	**ppm**				
JABT*	North Boring	NA	NA	NA	NA
JABB*	North Boring	NA	NA	NA	NA
JABP*	North Boring	NA	NA	NA	NA
NIAT*	South Boring	NA	NA	NA	NA
NIAB*	South Boring	NA	NA	NA	NA
NIAP*	South Boring	NA	NA	NA	NA
DMA	SEEP				NR
SLB+ Pond	3	NA	NA	NA	NA
AB Pond	2	NA	NA	NA	NA
LB+ Pond	1	NA	NA	NA	NA
PJD	Sand Filter				NR
ADD	Carbon Filter				NR

NA = not analyzed
NR = parameter not reported on State form
Blank Space = parameter run but not detected

Summary of pesticides, herbicides, and PCBs detected, Warren County Landfill, North Carolina.

Code	Identification	g-BHC (lindane)	chlordane	dieldrin	endrin	heptachlor	heptachlor epoxide	toxaphene	PCB	PCB-1260
Landfill Leachate	**ppm**									
QAR+	no. well (inlet)			NR		NR	NR		>>>	0.006
EZM	outlet		NR	NR		NR	NR			
NOV	south well			NR		NR	NR		>>>	0.0006
Groundwater	**ppm**									
BB	MW-1									
JDH	MW-1A									
ALB	MW-2									
RPAB	MW-3A (D)									
RBAB+ Exist.	MW-3 S									
RPF Exist.	MW-4									
JDW	MW-4A									
CEH	MW-5S									
PSG	MW-5D									
JOK	MW-6									
MMM	MW-7S									
BT	MW-7D									
CC	MW-8									
ADJ/JDA	MW-9									
RDRJ	MW-10S									
RAJR	MW-10D									
AJ	MW-11									
ASH	MW-12									
DRK OSW-2	Alston-BG									

NA = not analyzed
NR = *parameter not reported on State form*
Blank Space = parameter run but not detected

Summary of pesticides, herbicides, and PCBs detected, Warren County Landfill, North Carolina.

Code	Identification	methoxy-chlor	2,4-D	2,4,5-TP	hexachloro benzene
Landfill Leachate	**ppm**				
QAR+	no. well (inlet)				NR
EZM	outlet	NR			NR
NOV	south well				NR
Groundwater	**ppm**				
BB	MW-1				NR
JDH	MW-1A				NR
ALB	MW-2				NR
RPAB	MW-3A (D)				NR
RBAB+ Exist.	MW-3 S				NR
RPF Exist.	MW-4				NR
JDW	MW-4A				NR
CEH	MW-5S				NR
PSG	MW-5D				NR
JOK	MW-6				NR
MMM	MW-7S				NR
BT	MW-7D				NR
CC	MW-8				NR
ADJ/JDA	MW-9				NR
RDRJ	MW-10S				NR
RAJR	MW-10D				NR
AJ	MW-11				NR
ASH	MW-12				NR
DRK OSW-2	Alston-BG				NR

NA = not analyzed
NR = parameter not reported on State form
Blank Space = parameter run but not detected

Summary of metals detected, Warren County Landfill, NC.

Code	Identification		Barium	Chromium	Lead
QA/QC					
MB	Blank	mg/l	0.05		
KTB	Blank	mg/l	0.02		
TB	Blank	mg/l			
AW	Blank	mg/l	0.04		
JD	Blank	mg/l			
Background Surface Soils					
TMSS	OSW-3	mg/kg	86	22	20
LESS	OSW-2	mg/kg	33	20	
HESS	OSW-4	mg/kg	37	20	9.8
Well Boring Soils					
HM	MW-7	mg/kg	240	20	
WM	MW-11	mg/kg	150	22	
KM	MW-1	mg/kg	250	18	
DM	MW-12	mg/kg	170		
MM	MW-5	mg/kg	130		
Landfill Soils					
JABB*	North Boring	mg/kg	26	20	98
JABP*	North Boring	mg/kg	20	16	180
DMA	SEEP	mg/kg	69	9.8	
PJD	Sand Filter	mg/kg	35		
ADD	Carbon Filter	mg/kg	46		
Landfill Leachate					
QAR+	no. well (inlet)	mg/l	0.28		0.05
EZM	outlet	mg/l	0.03		
NOV	south well	mg/l	0.28		0.05
Groundwater					
BB	MW-1	mg/l	0.06		
JDH	MW-1A	mg/l	0.07	0.01	
ALB	MW-2	mg/l	0.06		
RPAB	MW-3A (D)	mg/l	0.09		
RBAB+ Exist.	MW-3 S	mg/l	0.06		
RPF Exist.	MW-4	mg/l	0.06		
JDW	MW-4A	mg/l	0.04		
CEH	MW-5S	mg/l	0.1		
PSG	MW-5D	mg/l	0.11		
JOK	MW-6	mg/l	0.06		
MMM	MW-7S	mg/l	0.09		
BT	MW-7D	mg/l	0.06		
CC	MW-8	mg/l	0.06	0.01	
ADJ/JDA	MW-9	mg/l	0.06		
RDRJ	MW-10S	mg/l	0.05		
RAJR	MW-10D	mg/l	0.03		
AJ	MW-11	mg/l	0.06		

NA = not analyzed
NR = parameter not reported on State form
Blank Space = parameter run but not detected

BFA

Summary of metals detected, Warren County Landfill, NC.

Code	Identification		Barium	Chromium	Lead
DRK OSW-2	Alston-BG	mg/l	0.07		
RAM	O'Neal-BG	mg/l	0.07		

NA = not analyzed
NR = parameter not reported on State form
Blank Space = parameter run but not detected

BFA

Summary of VOCs detected, Warren County Landfill, NC

Code	Identification	Acetone	Idomethane	MeCl2	CS2	2-Butanone	Chloro- form	Benzene	Toluene
QA/QC	ppb								
MB	Blank	97		2 J	Tr.	43			97
KTB	Blank			1 J,C			Tr.		
TB	Blank	23					1.6 J		
CAN	Trip Blank	Tr. C		2 J,C			1.6J		
AW	Blank	79		1 J,C		7 J	1 J		Tr.
JD	Blank			1 J,C			Tr.		
Stream Sediment									
CD Below B	RCUS								
Surface Soil									
Background Surface Soils									
Surface Water									
Well Boring Soils									
Landfill Soils	ppb								
ADD	Carbon Filter								Tr.
Landfill Leachate	ppb								
QAR+	no. well (inlet)	46	Tr.		Tr.	5 J,C		1 J	2 J
EZM	outlet	3 J,C							
NOV	south well	8 J,C			Tr.	24		1 J	Tr.
Groundwater	ppb								
JDH	MW-1A	16 J							
RPAB	MW-3A (D)	Tr. C							
RBAB+ Exist.	MW-3 S	3 J,C							

NA = not analyzed
NR = parameter not reported on state form
Blank Space = parameter run but not detected

BFA

Summary of VOCs detected, Warren County Landfill, NC

			Chloro-	Ethyl			
Code	**Identification**	2-Hexanone	benzene	benzene	Xylenes	1,4-DCB	1,2-DCB
QA/QC	ppb						
MB	Blank			Tr.	12	Tr.	
KTB	Blank						
TB	Blank						
CAN	Trip Blank						
AW	Blank	Tr.				Tr.	
JD	Blank						
Stream Sediment							
CD Below B	RCUS						
Surface Soil							
Background Surface Soils							
Surface Water							
Well Boring Soils							
Landfill Soils	ppb						
ADD	Carbon Filter						
Landfill Leachate	ppb						
QAR+	no. well (inlet)	Tr.	Tr.	Tr.	Tr.	2 J	Tr.
EZM	outlet						
NOV	south well		30	Tr.	Tr.	21	2 J
Groundwater	ppb						
JDH	MW-1A						
RPAB	MW-3A (D)						
RBAB+ Exist.	MW-3 S						

NA = not analyzed
NR = parameter not reported on state form
Blank Space = parameter run but not detected

BFA

Summary of VOCs detected, vvarren County Landfill, NC

Code	**Identification**	Acetone	Idomethane	MeCl2	CS2	2-Butanone	Chloro-form	Benzene	Toluene
JOK	MW-6	Tr. C							
MMM	MW-7S	Tr. C							
CC	MW-8	Tr. C							3 J
RDRJ	MW-10S	Tr. C							
RAJR	MW-10D						Tr.		
RRAM OSW4	O'Neal-BG	7 J,C							

NA = not analyzed
NR = parameter not reported on state form
Blank Space = parameter run but not detected

BFA

Summary of VOCs detected, Warren County Landfill, NC

			Chloro-	Ethyl			
Code	**Identification**	2-Hexanone	benzene	benzene	Xylenes	1,4-DCB	1,2-DCB
JOK	MW-6						
MMM	MW-7S						
CC	MW-8						
RDRJ	MW-10S						
RAJR	MW-10D						
RRAM OSW4	O'Neal-BG						

NA = not analyzed
NR = parameter not reported on state form
Blank Space = parameter run but not detected

BFA

Appendix 13
Chain of Custody Forms

FROM 9197153605 SOLID WASTE DIV 09.08.1997 15:23 P. 8

SOUTHERN TESTING & RESEARCH LABORATORIES, INC.
3809 Airport Drive • Wilson, NC 27896
919-237-4175 • Fax: 919-237-9341

CHAIN OF CUSTODY & ANALYSIS REQUEST

SEE REVERSE FOR INSTRUCTIONS

PAGE 1 of 1

LAB USE

(1) ORIGINAL REPORT TO: (Company and Individual) Div. Waste Management
(Address) 401 Oberlin Rd, Suite 150 Raleigh NC 27605

(2) CONTACT PERSON (Report) P. Lauffer

(3) PHONE # (Report)

FAX #

(4) ADDITIONAL ADDRESS (Invoice or Report) To go to Technical Advisor for A8 landfill workgroup

(5) CONTACT PERSON/PHONE # (Add'n)

(6) Requested Turnaround Time:
- ☐ Normal (2 weeks)
- ☐ Rush (1 week)*
- ☐ Emergency Rush (ASAP)*

(7) PROJECT NAME

(8) PROJECT# / PO #

(9) QUOTE #

Sample Container Info

Analyses Requested (Please Use Catalog #'s): PCB 1242, 1254, 1260 EPA-TO-4

Start	End	Comp	Grab	Sample Type	Description	Container Type	Size (Vol./Wt.)	# of Containers	Preservation		PCB
1	3/10-13/97		X	PUF	Prior to Sampling. After Cartridge preparation	Vol =	180165	L			
2			X	PUF		Vol =	183852	L			
3			X	PUF		Vol =	153240	L			

TRANSFER #	RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
1	x [signature]	3/7/97 11:30A	[signature]	3/7/97 11:30
2	[signature]	3/18/97 1:06	[signature]	3/18/97 1:08
3				

SAMPLER SIGNATURE: x [signature]

COMMENTS: Precleaned PUF Cartridges

SOUTHERN TESTING & RESEARCH LABORATORIES, INC.
3809 Airport Drive • Wilson, NC 27896
919-237-4175 • Fax: 919-237-9341

CHAIN OF CUSTODY & ANALYSIS REQUEST

SEE REVERSE FOR INSTRUCTIONS

(1) ORIGINAL REPORT TO: (Company and Individual) Same; Address	(2) CONTACT PERSON (Report)
	(3) PHONE # (Report); FAX #
(4) ADDITIONAL ADDRESS (Invoice or Report)	(5) CONTACT PERSON/PHONE # (Add'n)

LAB USE: LOGGED [illegible]

(6) **Requested Turnaround Time:**
- ☐ Normal (2 weeks)
- ☐ Rush (1 week)*
- ☐ Emergency Rush (ASAP)*

(7) PROJECT NAME

PROJECT/PO # | QUOTE #

Sample Container Info.: Container Type | Size (Vol./Wt.) | # of Containers | Preservation

Analyses Requested (Please Use Catalog #'s): 8082

Sample ID	Start Date/Time	End Date/Time	Comp/Grab	Sample Type	Description
W-97th (1)					Test for PCB : Congeners of PCB (DCE TCA etc.)
W BG (2)					"
(3) Field Blank					"
(4) Fence South					"
(5) Conc. South					"
(6) Ctr. Vent.					"
(7) Vent.					"
(8) 115' for Fence					"
(9) Fence					"
					"

TRANSFER #	RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
1	[signature]	2/21/97-12:40	Pamela Barnes	02-21-97 12:40
2				
3				

SAMPLER SIGNATURE:

COMMENTS:

SAM - F001 (1/95) *ADDITIONAL CHARGES WILL APPLY.

COPY

SOUTHERN TESTING & RESEARCH LABORATORIES, INC.
3809 Airport Drive • Wilson, NC 27896
919-237-4175 • Fax 919-237-9341

CHAIN OF CUSTODY & ANALYSIS REQUEST

SEE REVERSE FOR INSTRUCTIONS

LAB USE

(1) ORIGINAL REPORT TO: (Company and Individual)
Mike Kelly, Pierce Louffer, Div. Waste Mgmt.
401 Oberlin Rd., Ste 150, Raleigh NC 27605
also: PCB Landfill Workgroup
will call later for address

(2) CONTACT PERSON (Report)
Pierce Louffer, Joel Hearn ...
Mike Kelly

(3) PHONE # (Report) 919-733-2178

FAX # 715-3605

(4) ADDITIONAL ADDRESS (Invoice or Report)
Same as above

(5) CONTACT PERSON/PHONE # (Add'n)

(6) **Requested Turnaround Time:**
- [ ] Normal (2 weeks)
- [x] Rush (1 week)*
- [ ] Emergency Rush (ASAP)*

(7) PROJECT NAME: PCB Landfill

(8) PROJECT # / PO #

(9) QUOTE #

Sample Container Info: Container Type | Size (Vol./Wt.) | # of Containers | Preservation

Analyses Requested (Please Use Catalog #'s): TO-8

Sample	Start	End	Comp	Grab	Sample Type	Description
W-13011 (1)					Air	Test for PCB, and Congeners of PCBs (in Dec. etc.)
W-13475 (2)						"
W-13500 (3)						"
W-13271 (4)						"
W-13535 (5)						"
W-13393 (6)						"
W-13... (7)						"
W-13... (8)						"
W-13... (9)						"
W-13... (10)						"

TRANSFER #	RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
1	[signature]	2/21/97 12:40	Pamela ...	2/21/97 12:40
2			3/1/97	
3				

SAMPLER SIGNATURE:

COMMENTS: 3/1/...

*ADDITIONAL CHARGES WILL APPLY.

COPY

SOUTHERN TESTING & RESEARCH LABORATORIES, INC.
3809 Airport Drive • Wilson, NC 27896
919-237-4175 • Fax: 919-237-9341

CHAIN OF CUSTODY & ANALYSIS REQUEST

SEE REVERSE FOR INSTRUCTIONS

PAGE ___ of ___

LAB USE

(1) ORIGINAL REPORT TO: (Company and Individual) Dr. Wm. G. Meyer
401 Oberlin Rd Suite 150
Raleigh NC 27605
(Address)

(2) CONTACT PERSON (Report)
Pierre Loeffler

(3) PHONE # (Report) 919-733-2178
FAX # 715-3605

(4) ADDITIONAL ADDRESS (Invoice or Report) Dr. Joel Hirschhorn & Assoc.
2401 Blueridge Ave. Suite 41 Wheaton, MD 20902

(5) CONTACT PERSON/PHONE # (Add'l)

(6) Requested Turnaround Time:
- [ ] Normal (2 weeks)
- [x] Rush (1 week)*
- [ ] Emergency Rush (ASAP)*

(7) PROJECT NAME: PCB Landfill

(8) PROJECT/PO #:

(9) QUOTE #:

Sample Container Info: Container Type | Size (mL/oz) | # of Containers | Preservation

Analyses Requested (Please Use Catalog #'s): PCBs Landfill (1242, 1254, 1260)

	Start	End	Comp/Grab	Sample Type	Description
15395	2/24/97	323 mins	Air		Southeast (1)
13017		323 mins	Air		Southwest (2)
15394		323 mins	Air		Southcentral (3)
15401		236 mins	Air		Northeast (4)
13013		236 mins	Air		Northwest (5)
15400		236 mins	Air		Northcentral (6)

TRANSFER #	RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
1	x [signature]	2/25/97 1:??	Jean Rosser	2/25 1:45
2	Jean Rosser	2/26 4:15		
3				

SAMPLER SIGNATURE: x [signature]

COMMENTS:

SAM-F001 (1/97)

*ADDITIONAL CHARGES WILL APPLY.

COPY

FROM 9197153605 SOLID WASTE DIV 09.08.1997 15:26 P.11

FROM 919715360S SOLID WASTE DIV 09.08.1997 15:27 P.12

SOUTHERN TESTING & RESEARCH LABORATORIES, INC.
3809 Airport Drive • Wilson, NC 27896
919-237-4175 • Fax 919-237-9341

CHAIN OF CUSTODY & ANALYSIS REQUEST

SEE REVERSE FOR INSTRUCTIONS

PAGE ______ of ______

① ORIGINAL REPORT TO: (Company and Individual) Div. [illegible]
401 Oberlin Rd Suite 150
Raleigh NC 27605
(Address)

② CONTACT PERSON (Report) [illegible]

③ PHONE # (Report) [illegible]
FAX # [illegible]

④ ADDITIONAL ADDRESS (Invoice or Report) [illegible]
[illegible]

⑤ CONTACT PERSON/PHONE # (Add'n)

LAB USE
LOGGED IN BY (INITIAL) | SAMPLE #
DATE
REC'D ON ICE? ☐YES ☐NO TEMP
ACCOUNT #
SAMPLING CHARGES
TRANSPORT

⑥ Requested Turnaround Time:
☐ Normal (2 weeks)
☒ Rush (1 week)*
☐ Emergency Rush (ASAP)*

⑦ PROJECT NAME PCB Landfill
⑧ PROJECT/P.O. #
⑨ QUOTE #

Sample Container Info: Container Type | Size (No./Wt.) | # of Containers | Preservation

Analyses Requested (Please Use Catalog #'s): PCB [illegible] (1242, 1254, 1260)

Item #	Start Date / Time	End Date / Time	Comp/Grab	Sample Type	Description Sample Marks	Container Type	Size	# of Containers	Preservation									Comments
1537[illegible]	2/25/97	373 mins	Air		Southeast													
13017		373 mins	Air		Southwest													
1534[illegible]		373 mins	Air		Southcentral													
15901		236 mins	Air		Northeast													
13143		236 mins	Air		Northwest													
15900		236 mins	Air		Northcentral													

TRANSFER #	RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
1	x [signature]	2/25/97 1:3[illegible]	[signature]	2/25 1:45
2				
3				

SAMPLER SIGNATURE: x [signature]
COMMENTS:

SAM - F001 (1/97)

*ADDITIONAL CHARGES WILL APPLY

COPY

SOUTHERN TESTING
& RESEARCH LABORATORIES, INC.
3809 Airport Drive • Wilson, NC 27896
919-237-4175 • Fax 919-237-9341

CHAIN OF CUSTODY & ANALYSIS REQUEST

SEE REVERSE FOR INSTRUCTIONS

LAB USE

ORIGINAL REPORT TO: (Company and Individual) Div. Waste Management
(Address) 401 Oberlin Rd, Suite 150 Raleigh NC 27605

CONTACT PERSON (Report) P. Lauffer

PHONE # (Report)

FAX #

ADDITIONAL ADDRESS (Invoice or Report) To go to Technical Advisor for PCB landfill workgroup

CONTACT PERSON/PHONE # (Add'n)

Requested Turnaround Time:
- ☐ Normal (2 weeks)
- ☐ Rush (1 week)*
- ☐ Emergency Rush (ASAP)*

PROJECT NAME

PROJECT# / PO #

QUOTE #

Sample Container Info: Container Type, Size (Vol./Wt.), # of Containers, Preservation

Analyses Requested (Please Use Catalog #'s): PCB 1242, 1254, 1260

#	Start	End	Comp	Grab	Sample Type	Description	Sample Container Info / Analyses
1	3/13-15/97			✓	PUF	Prior to Sampling: After cartridge preparation	Vol = 180165 L
2	"			✓	PUF		Vol = 183852 L
3	"			✓	PUF	"	Vol = 153240 L
~~4~~						"	
~~5~~						"	
~~6~~						"	

TRANSFER #	RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
1	x [signature]	3/7/97 11:30A	[signature]	3/7/97 11:30
2	[signature]	3/18/97 1:06	[signature]	3/18/97 1:08
3				

SAMPLER SIGNATURE: x [signature]

COMMENTS: Precleaned PUF Cartridges

SAM - F001 (1/97)

* ADDITIONAL CHARGES WILL APPLY.

COPY

END

Appendix 14
Chemical Results from ETG and Ecologic Analysis

Appendix 15
Results of EPA Split Samples

Sample 3679 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

EXTRACTABLES SCAN

Collected By:
Beginning: 03/12/97 15:15
Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: MW3A = PAB MD Number: ME69 Inorg Contractor: INCHVT
Media: GROUNDWA D Number: ME69 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
5J	UG/L	PHENOL
10U	UG/L	BIS(2-CHLOROETHYL) ETHER
10U	UG/L	2-CHLOROPHENOL
10U	UG/L	1,3-DICHLOROBENZENE
10U	UG/L	1,4-DICHLOROBENZENE
10U	UG/L	1,2-DICHLOROBENZENE
10U	UG/L	2-METHYLPHENOL
10U	UG/L	BIS(2-CHLOROISOPROPYL) ETHER
10U	UG/L	(3-AND/OR 4-)METHYLPHENOL
10U	UG/L	N-NITROSODI-N-PROPYLAMINE
10U	UG/L	HEXACHLOROETHANE
10U	UG/L	NITROBENZENE
10U	UG/L	ISOPHORONE
10U	UG/L	2-NITROPHENOL
10U	UG/L	2,4-DIMETHYLPHENOL
10UR	UG/L	BIS(2-CHLOROETHOXY)METHANE
10U	UG/L	2,4-DICHLOROPHENOL
10U	UG/L	1,2,4-TRICHLOROBENZENE
10U	UG/L	NAPHTHALENE
10U	UG/L	4-CHLOROANILINE
10U	UG/L	HEXACHLOROBUTADIENE
10U	UG/L	4-CHLORO-3-METHYLPHENOL
10U	UG/L	2-METHYLNAPHTHALENE
10U	UG/L	HEXACHLOROCYCLOPENTADIENE (HCCP)
10U	UG/L	2,4,6-TRICHLOROPHENOL
25U	UG/L	2,4,5-TRICHLOROPHENOL
10U	UG/L	2-CHLORONAPHTHALENE
25U	UG/L	2-NITROANILINE
10U	UG/L	DIMETHYL PHTHALATE
10U	UG/L	ACENAPHTHYLENE
10U	UG/L	2,6-DINITROTOLUENE
25U	UG/L	3-NITROANILINE
10U	UG/L	ACENAPHTHENE
25U	UG/L	2,4-DINITROPHENOL
25U	UG/L	4-NITROPHENOL
10U	UG/L	DIBENZOFURAN
10U	UG/L	2,4-DINITROTOLUENE
10U	UG/L	DIETHYL PHTHALATE
10U	UG/L	4-CHLOROPHENYL PHENYL ETHER
10U	UG/L	FLUORENE
25U	UG/L	4-NITROANILINE
25U	UG/L	2-METHYL-4,6-DINITROPHENOL
10U	UG/L	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10U	UG/L	4-BROMOPHENYL PHENYL ETHER
10U	UG/L	HEXACHLOROBENZENE (HCB)
10U	UG/L	PENTACHLOROPHENOL
10U	UG/L	PHENANTHRENE
10U	UG/L	ANTHRACENE
10U	UG/L	CARBAZOLE
10U	UG/L	DI-N-BUTYLPHTHALATE
10U	UG/L	FLUORANTHENE
10U	UG/L	PYRENE
10U	UG/L	BENZYL BUTYL PHTHALATE
10U	UG/L	3,3'-DICHLOROBENZIDINE
10U	UG/L	BENZO(A)ANTHRACENE
10U	UG/L	CHRYSENE
10U	UG/L	BIS(2-ETHYLHEXYL) PHTHALATE
24J	UG/L	DI-N-OCTYLPHTHALATE
10UJ	UG/L	BENZO(B AND/OR K)FLUORANTHENE
10UJ	UG/L	BENZO-A-PYRENE
10UJ	UG/L	INDENO (1,2,3-CD) PYRENE
10UJ	UG/L	DIBENZO(A,H)ANTHRACENE
10UJ	UG/L	BENZO(GHI)PERYLENE

-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3679 FY 1997 Project: 97-0171

MISCELLANEOUS COMPOUNDS

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: MW3A MD Number: ME69 Inorg Contractor: INCHVT

Media: GROUNDWA D Number: ME69 Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/12/97 15:15

Ending:

RESULTS	UNITS	ANALYTE
2000JN		CAPROLACTAM
3JN		OLEYL ALCOHOL
400J		15 UNIDENTIFIED COMPOUNDS

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3680 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

EXTRACTABLES SCAN

Collected By:

Facility: WARREN COUNTY PCB LANDFILL , NC

Beginning: 03/12/97 18:10

Ending:

Program: NSF Case Number: 25349

Id/Station: MW3 MD Number: ME70 Inorg Contractor: INCHVT

Media: GROUNDWA D Number: ME70 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
10U	UG/L	PHENOL
10U	UG/L	BIS(2-CHLOROETHYL) ETHER
10U	UG/L	2-CHLOROPHENOL
10U	UG/L	1,3-DICHLOROBENZENE
10U	UG/L	1,4-DICHLOROBENZENE
10U	UG/L	1,2-DICHLOROBENZENE
10U	UG/L	2-METHYLPHENOL
10U	UG/L	BIS(2-CHLOROISOPROPYL) ETHER
10U	UG/L	(3-AND/OR 4-)METHYLPHENOL
10U	UG/L	N-NITROSODI-N-PROPYLAMINE
10U	UG/L	HEXACHLOROETHANE
10U	UG/L	NITROBENZENE
10U	UG/L	ISOPHORONE
10U	UG/L	2-NITROPHENOL
10U	UG/L	2,4-DIMETHYLPHENOL
10UR	UG/L	BIS(2-CHLOROETHOXY)METHANE
10U	UG/L	2,4-DICHLOROPHENOL
10U	UG/L	1,2,4-TRICHLOROBENZENE
10U	UG/L	NAPHTHALENE
10U	UG/L	4-CHLOROANILINE
10U	UG/L	HEXACHLOROBUTADIENE
10U	UG/L	4-CHLORO-3-METHYLPHENOL
10U	UG/L	2-METHYLNAPHTHALENE
10U	UG/L	HEXACHLOROCYCLOPENTADIENE (HCCP)
10U	UG/L	2,4,6-TRICHLOROPHENOL
25U	UG/L	2,4,5-TRICHLOROPHENOL
10U	UG/L	2-CHLORONAPHTHALENE
25U	UG/L	2-NITROANILINE
10U	UG/L	DIMETHYL PHTHALATE
10U	UG/L	ACENAPHTHYLENE
10U	UG/L	2,6-DINITROTOLUENE
25U	UG/L	3-NITROANILINE
10U	UG/L	ACENAPHTHENE
25U	UG/L	2,4-DINITROPHENOL
25U	UG/L	4-NITROPHENOL
10U	UG/L	DIBENZOFURAN
10U	UG/L	2,4-DINITROTOLUENE
10U	UG/L	DIETHYL PHTHALATE

RESULTS	UNITS	ANALYTE
10U	UG/L	4-CHLOROPHENYL PHENYL ETHER
10U	UG/L	FLUORENE
25U	UG/L	4-NITROANILINE
25U	UG/L	2-METHYL-4,6-DINITROPHENOL
10U	UG/L	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10U	UG/L	4-BROMOPHENYL PHENYL ETHER
10U	UG/L	HEXACHLOROBENZENE (HCB)
10U	UG/L	PENTACHLOROPHENOL
10U	UG/L	PHENANTHRENE
10U	UG/L	ANTHRACENE
10U	UG/L	CARBAZOLE
10U	UG/L	DI-N-BUTYLPHTHALATE
10U	UG/L	FLUORANTHENE
10U	UG/L	PYRENE
10U	UG/L	BENZYL BUTYL PHTHALATE
10U	UG/L	3,3'-DICHLOROBENZIDINE
10U	UG/L	BENZO(A)ANTHRACENE
10U	UG/L	CHRYSENE
10U	UG/L	BIS(2-ETHYLHEXYL) PHTHALATE
10U	UG/L	DI-N-OCTYLPHTHALATE
10U	UG/L	BENZO(B AND/OR K)FLUORANTHENE
10U	UG/L	BENZO-A-PYRENE
10U	UG/L	INDENO (1,2,3-CD) PYRENE
10U	UG/L	DIBENZO(A,H)ANTHRACENE
10U	UG/L	BENZO(GHI)PERYLENE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

EXTRACTABLES SAMPLE ANALYSIS — EPA - REGION IV SESD ATHENS, GA — PRINTED 05/07/97 15:52

Sample 3681 FY 1997 Project: 97-0171

EXTRACTABLES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: LCP1 MD Number: ME71 Inorg Contractor: INCHVT
Media: SOIL D Number: ME71 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/13/97 11:40
Ending:

RESULTS	UNITS	ANALYTE
460UJ	UG/KG	PHENOL
460UJ	UG/KG	BIS(2-CHLOROETHYL) ETHER
460UJ	UG/KG	2-CHLOROPHENOL
460UJ	UG/KG	1,3-DICHLOROBENZENE
460UJ	UG/KG	1,4-DICHLOROBENZENE
460UJ	UG/KG	1,2-DICHLOROBENZENE
460UJ	UG/KG	2-METHYLPHENOL
460UJ	UG/KG	BIS(2-CHLOROISOPROPYL) ETHER
460UJ	UG/KG	(3-AND/OR 4-)METHYLPHENOL
460UJ	UG/KG	N-NITROSODI-N-PROPYLAMINE
460UJ	UG/KG	HEXACHLOROETHANE
460UJ	UG/KG	NITROBENZENE
460UJ	UG/KG	ISOPHORONE
460UJ	UG/KG	2-NITROPHENOL
460UJ	UG/KG	2,4-DIMETHYLPHENOL
460UR	UG/KG	BIS(2-CHLOROETHOXY)METHANE
460UJ	UG/KG	2,4-DICHLOROPHENOL
460UJ	UG/KG	1,2,4-TRICHLOROBENZENE
460UJ	UG/KG	NAPHTHALENE
460UJ	UG/KG	4-CHLOROANILINE
460UJ	UG/KG	HEXACHLOROBUTADIENE
460UJ	UG/KG	4-CHLORO-3-METHYLPHENOL
460UJ	UG/KG	2-METHYLNAPHTHALENE
460UJ	UG/KG	HEXACHLOROCYCLOPENTADIENE (HCCP)
460UJ	UG/KG	2,4,6-TRICHLOROPHENOL
1200UJ	UG/KG	2,4,5-TRICHLOROPHENOL
460UJ	UG/KG	2-CHLORONAPHTHALENE
1200UJ	UG/KG	2-NITROANILINE
460UJ	UG/KG	DIMETHYL PHTHALATE
460UJ	UG/KG	ACENAPHTHYLENE
460UJ	UG/KG	2,6-DINITROTOLUENE
1200UJ	UG/KG	3-NITROANILINE
460UJ	UG/KG	ACENAPHTHENE
1200UJ	UG/KG	2,4-DINITROPHENOL
1200UJ	UG/KG	4-NITROPHENOL
460UJ	UG/KG	DIBENZOFURAN
460UJ	UG/KG	2,4-DINITROTOLUENE
460UJ	UG/KG	DIETHYL PHTHALATE

RESULTS	UNITS	ANALYTE
460UJ	UG/KG	4-CHLOROPHENYL PHENYL ETHER
460UJ	UG/KG	FLUORENE
1200UJ	UG/KG	4-NITROANILINE
1200UJ	UG/KG	2-METHYL-4,6-DINITROPHENOL
460UJ	UG/KG	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
460UJ	UG/KG	4-BROMOPHENYL PHENYL ETHER
460UJ	UG/KG	HEXACHLOROBENZENE (HCB)
1200UJ	UG/KG	PENTACHLOROPHENOL
460UJ	UG/KG	PHENANTHRENE
460UJ	UG/KG	ANTHRACENE
460UJ	UG/KG	CARBAZOLE
460UJ	UG/KG	DI-N-BUTYLPHTHALATE
460UJ	UG/KG	FLUORANTHENE
460UJ	UG/KG	PYRENE
460UJ	UG/KG	BENZYL BUTYL PHTHALATE
460UJ	UG/KG	3,3'-DICHLOROBENZIDINE
460UJ	UG/KG	BENZO(A)ANTHRACENE
460UJ	UG/KG	CHRYSENE
460UJ	UG/KG	BIS(2-ETHYLHEXYL) PHTHALATE
460UJ	UG/KG	DI-N-OCTYLPHTHALATE
460UJ	UG/KG	BENZO(B AND/OR K)FLUORANTHENE
460UJ	UG/KG	BENZO-A-PYRENE
460UJ	UG/KG	INDENO (1,2,3-CD) PYRENE
460UJ	UG/KG	DIBENZO(A,H)ANTHRACENE
460UJ	UG/KG	BENZO(GHI)PERYLENE
29	%	% MOISTURE

EXCESSIVE HOLDING TIME

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3681 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

MISCELLANEOUS COMPOUNDS

Facility: WARREN COUNTY PCB LANDFILL , NC

Collected By:
Beginning: 03/13/97 11:40
Ending:

Program: NSF
Case Number: 25349
Id/Station: LCP1
MD Number: ME71
Inorg Contractor: INCHVT
Media: SOIL
D Number: ME71
Org Contractor: IEA

RESULTS	UNITS	ANALYTE
300JN		CARBOXYLIC ACIDS
800J		1 UNIDENTIFIED COMPOUND

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3682 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

EXTRACTABLES SCAN

Collected By:
Beginning: 03/13/97 12:15
Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: LCP3 MD Number: ME72 Inorg Contractor: INCHVT
Media: SOIL D Number: ME72 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
480UJ	UG/KG	PHENOL
480UJ	UG/KG	BIS(2-CHLOROETHYL) ETHER
480UJ	UG/KG	2-CHLOROPHENOL
480UJ	UG/KG	1,3-DICHLOROBENZENE
480UJ	UG/KG	1,4-DICHLOROBENZENE
480UJ	UG/KG	1,2-DICHLOROBENZENE
480UJ	UG/KG	2-METHYLPHENOL
480UJ	UG/KG	BIS(2-CHLOROISOPROPYL) ETHER
480UJ	UG/KG	(3-AND/OR 4-)METHYLPHENOL
480UJ	UG/KG	N-NITROSODI-N-PROPYLAMINE
480UJ	UG/KG	HEXACHLOROETHANE
480UJ	UG/KG	NITROBENZENE
480UJ	UG/KG	ISOPHORONE
480UJ	UG/KG	2-NITROPHENOL
480UJ	UG/KG	2,4-DIMETHYLPHENOL
480UR	UG/KG	BIS(2-CHLOROETHOXY)METHANE
480UJ	UG/KG	2,4-DICHLOROPHENOL
480UJ	UG/KG	1,2,4-TRICHLOROBENZENE
480UJ	UG/KG	NAPHTHALENE
480UJ	UG/KG	4-CHLOROANILINE
480UJ	UG/KG	HEXACHLOROBUTADIENE
480UJ	UG/KG	4-CHLORO-3-METHYLPHENOL
480UJ	UG/KG	2-METHYLNAPHTHALENE
480UJ	UG/KG	HEXACHLOROCYCLOPENTADIENE (HCCP)
480UJ	UG/KG	2,4,6-TRICHLOROPHENOL
1200UJ	UG/KG	2,4,5-TRICHLOROPHENOL
480UJ	UG/KG	2-CHLORONAPHTHALENE
1200UJ	UG/KG	2-NITROANILINE
480UJ	UG/KG	DIMETHYL PHTHALATE
480UJ	UG/KG	ACENAPHTHYLENE
480UJ	UG/KG	2,6-DINITROTOLUENE
1200UJ	UG/KG	3-NITROANILINE
480UJ	UG/KG	ACENAPHTHENE
1200UJ	UG/KG	2,4-DINITROPHENOL
1200UJ	UG/KG	4-NITROPHENOL
480UJ	UG/KG	DIBENZOFURAN
480UJ	UG/KG	2,4-DINITROTOLUENE
480UJ	UG/KG	DIETHYL PHTHALATE
480UJ	UG/KG	4-CHLOROPHENYL PHENYL ETHER
480UJ	UG/KG	FLUORENE
1200UJ	UG/KG	4-NITROANILINE
1200UJ	UG/KG	2-METHYL-4,6-DINITROPHENOL
480UJ	UG/KG	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
480UJ	UG/KG	4-BROMOPHENYL PHENYL ETHER
480UJ	UG/KG	HEXACHLOROBENZENE (HCB)
1200UJ	UG/KG	PENTACHLOROPHENOL
480UJ	UG/KG	PHENANTHRENE
480UJ	UG/KG	ANTHRACENE
480UJ	UG/KG	CARBAZOLE
480UJ	UG/KG	DI-N-BUTYLPHTHALATE
480UJ	UG/KG	FLUORANTHENE
480UJ	UG/KG	PYRENE
480UJ	UG/KG	BENZYL BUTYL PHTHALATE
480UJ	UG/KG	3,3'-DICHLOROBENZIDINE
480UJ	UG/KG	BENZO(A)ANTHRACENE
480UJ	UG/KG	CHRYSENE
480UJ	UG/KG	BIS(2-ETHYLHEXYL) PHTHALATE
480UJ	UG/KG	DI-N-OCTYLPHTHALATE
480UJ	UG/KG	BENZO(B AND/OR K)FLUORANTHENE
480UJ	UG/KG	BENZO-A-PYRENE
480UJ	UG/KG	INDENO (1,2,3-CD) PYRENE
480UJ	UG/KG	DIBENZO(A,H)ANTHRACENE
480UJ	UG/KG	BENZO(GHI)PERYLENE
31	%	% MOISTURE

EXCESSIVE HOLDING TIME

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3682 FY 1997 Project: 97-0171

MISCELLANEOUS COMPOUNDS

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: LCP3

Media: SOIL

Case Number: 25349

MD Number: ME72

D Number: ME72

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/13/97 12:15

Ending:

RESULTS UNITS	ANALYTE
300JN	CARBOXYLIC ACIDS
4000J	4 UNIDENTIFIED COMPOUNDS

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3683 FY 1997 Project: 97-0171

EXTRACTABLES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: EWN MD Number: ME73 Inorg Contractor: INCHVT
Media: LEACHATE D Number: ME73 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/13/97 15:10
Ending:

RESULTS	UNITS	ANALYTE
10U	UG/L	PHENOL
10U	UG/L	BIS(2-CHLOROETHYL) ETHER
10U	UG/L	2-CHLOROPHENOL
10U	UG/L	1,3-DICHLOROBENZENE
2J	UG/L	1,4-DICHLOROBENZENE
10U	UG/L	1,2-DICHLOROBENZENE
10U	UG/L	2-METHYLPHENOL
10U	UG/L	BIS(2-CHLOROISOPROPYL) ETHER
15	UG/L	(3-AND/OR 4-)METHYLPHENOL
10U	UG/L	N-NITROSODI-N-PROPYLAMINE
10U	UG/L	HEXACHLOROETHANE
10U	UG/L	NITROBENZENE
10U	UG/L	ISOPHORONE
10U	UG/L	2-NITROPHENOL
10U	UG/L	2,4-DIMETHYLPHENOL
10UR	UG/L	BIS(2-CHLOROETHOXY)METHANE
10U	UG/L	2,4-DICHLOROPHENOL
10U	UG/L	1,2,4-TRICHLOROBENZENE
10U	UG/L	NAPHTHALENE
10U	UG/L	4-CHLOROANILINE
10U	UG/L	HEXACHLOROBUTADIENE
10U	UG/L	4-CHLORO-3-METHYLPHENOL
10U	UG/L	2-METHYLNAPHTHALENE
10U	UG/L	HEXACHLOROCYCLOPENTADIENE (HCCP)
10U	UG/L	2,4,6-TRICHLOROPHENOL
25U	UG/L	2,4,5-TRICHLOROPHENOL
10U	UG/L	2-CHLORONAPHTHALENE
25U	UG/L	2-NITROANILINE
10U	UG/L	DIMETHYL PHTHALATE
10U	UG/L	ACENAPHTHYLENE
10U	UG/L	2,6-DINITROTOLUENE
25U	UG/L	3-NITROANILINE
10U	UG/L	ACENAPHTHENE
25U	UG/L	2,4-DINITROPHENOL
25U	UG/L	4-NITROPHENOL
10U	UG/L	DIBENZOFURAN
10U	UG/L	2,4-DINITROTOLUENE
10U	UG/L	DIETHYL PHTHALATE

RESULTS	UNITS	ANALYTE
10U	UG/L	4-CHLOROPHENYL PHENYL ETHER
10U	UG/L	FLUORENE
25U	UG/L	4-NITROANILINE
15U	UG/L	2-METHYL-4,6-DINITROPHENOL
10U	UG/L	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10U	UG/L	4-BROMOPHENYL PHENYL ETHER
10U	UG/L	HEXACHLOROBENZENE (HCB)
25U	UG/L	PENTACHLOROPHENOL
10U	UG/L	PHENANTHRENE
10U	UG/L	ANTHRACENE
10U	UG/L	CARBAZOLE
10U	UG/L	DI-N-BUTYLPHTHALATE
10U	UG/L	FLUORANTHENE
10U	UG/L	PYRENE
10U	UG/L	BENZYL BUTYL PHTHALATE
10U	UG/L	3,3'-DICHLOROBENZIDINE
10U	UG/L	BENZO(A)ANTHRACENE
10U	UG/L	CHRYSENE
10U	UG/L	BIS(2-ETHYLHEXYL) PHTHALATE
10U	UG/L	DI-N-OCTYLPHTHALATE
10U	UG/L	BENZO(B AND/OR K)FLUORANTHENE
10U	UG/L	BENZO-A-PYRENE
10U	UG/L	INDENO (1,2,3-CD) PYRENE
10U	UG/L	DIBENZO(A,H)ANTHRACENE
10U	UG/L	BENZO(GHI)PERYLENE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3683 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

MISCELLANEOUS COMPOUNDS

Collected By:
Beginning: 03/13/97 15:10
Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: EWN MD Number: ME73 Inorg Contractor: INCHVT
Media: LEACHATE D Number: ME73 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
20JN		DIMETHYLPHENOL(NOT 2,4)
300JN		BENZENEACETIC ACID
8JN		DIHYDROINDAZOLONE
50J		2 UNIDENTIFIED COMPOUNDS
4JN		BENZENEPROPANOIC ACID

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3676 FY 1997 Project: 97-0171

PESTICIDES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: BW3 MD Number: ME66 Inorg Contractor: INCHVT
Media: GROUNDWA D Number: ME66 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/11/97 13:43
Ending:

RESULTS	UNITS	ANALYTE
0.050UJ	UG/L	ALPHA-BHC
0.050UJ	UG/L	BETA-BHC
0.050UJ	UG/L	DELTA-BHC
0.050UJ	UG/L	GAMMA-BHC (LINDANE)
0.050UJ	UG/L	HEPTACHLOR
0.050UJ	UG/L	ALDRIN
0.050UJ	UG/L	HEPTACHLOR EPOXIDE
0.050UJ	UG/L	ENDOSULFAN I (ALPHA)
0.10UJ	UG/L	DIELDRIN
0.10UJ	UG/L	4,4'-DDE (P,P'-DDE)
0.10UJ	UG/L	ENDRIN
0.10UJ	UG/L	ENDOSULFAN II (BETA)
0.10UJ	UG/L	4,4'-DDD (P,P'-DDD)
0.10UJ	UG/L	ENDOSULFAN SULFATE
0.10UJ	UG/L	4,4'-DDT (P,P'-DDT)
0.50UJ	UG/L	METHOXYCHLOR
0.10UJ	UG/L	ENDRIN KETONE
0.10UJ	UG/L	ENDRIN ALDEHYDE
0.050UJ	UG/L	ALPHA-CHLORDANE /2
0.050UJ	UG/L	GAMMA-CHLORDANE /2
5.0UJ	UG/L	TOXAPHENE
1.0UR	UG/L	PCB-1016 (AROCLOR 1016)
2.0UJ	UG/L	PCB-1221 (AROCLOR 1221)
1.0UJ	UG/L	PCB-1232 (AROCLOR 1232)
1.0UJ	UG/L	PCB-1242 (AROCLOR 1242)
1.0UJ	UG/L	PCB-1248 (AROCLOR 1248)
1.0UJ	UG/L	PCB-1254 (AROCLOR 1254)
1.0UJ	UG/L	PCB-1260 (AROCLOR 1260)

HOLDING TIMES EXCEEDED(40 CFR 136,OCTOBER 26,1984)

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3677 FY 1997 Project: 97-0171

PESTICIDES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: SD5 MD Number: ME67 Inorg Contractor: INCHVT
Media: SOIL D Number: ME67 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/12/97 12:30
Ending:

RESULTS	UNITS	ANALYTE
4.6U	UG/KG	ALPHA-BHC
4.6U	UG/KG	BETA-BHC
4.6U	UG/KG	DELTA-BHC
4.6U	UG/KG	GAMMA-BHC (LINDANE)
4.6U	UG/KG	HEPTACHLOR
4.6U	UG/KG	ALDRIN
4.6U	UG/KG	HEPTACHLOR EPOXIDE
4.6U	UG/KG	ENDOSULFAN I (ALPHA)
8.9U	UG/KG	DIELDRIN
8.9U	UG/KG	4,4'-DDE (P,P'-DDE)
8.9U	UG/KG	ENDRIN
8.9U	UG/KG	ENDOSULFAN II (BETA)
8.9U	UG/KG	4,4'-DDD (P,P'-DDD)
8.9U	UG/KG	ENDOSULFAN SULFATE
8.9U	UG/KG	4,4'-DDT (P,P'-DDT)
46U	UG/KG	METHOXYCHLOR
8.9U	UG/KG	ENDRIN KETONE
8.9U	UG/KG	ENDRIN ALDEHYDE
4.6U	UG/KG	ALPHA-CHLORDANE /2
4.6U	UG/KG	GAMMA-CHLORDANE /2
460U	UG/KG	TOXAPHENE
89UR	UG/KG	PCB-1016 (AROCLOR 1016)
180U	UG/KG	PCB-1221 (AROCLOR 1221)
89U	UG/KG	PCB-1232 (AROCLOR 1232)
89U	UG/KG	PCB-1242 (AROCLOR 1242)
89U	UG/KG	PCB-1248 (AROCLOR 1248)
89U	UG/KG	PCB-1254 (AROCLOR 1254)
89U	UG/KG	PCB-1260 (AROCLOR 1260)
63	%	% MOISTURE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3678 FY 1997 Project: 97-0171

PESTICIDES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: SW2 MD Number: ME68 Inorg Contractor: INCHVT
Media: SURFACEWA D Number: ME68 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/12/97 13:15
Ending:

RESULTS	UNITS	ANALYTE
0.050U	UG/L	ALPHA-BHC
0.050U	UG/L	BETA-BHC
0.050U	UG/L	DELTA-BHC
0.050U	UG/L	GAMMA-BHC (LINDANE)
0.050U	UG/L	HEPTACHLOR
0.050U	UG/L	ALDRIN
0.050U	UG/L	HEPTACHLOR EPOXIDE
0.050U	UG/L	ENDOSULFAN I (ALPHA)
0.10U	UG/L	DIELDRIN
0.10U	UG/L	4,4'-DDE (P,P'-DDE)
0.10U	UG/L	ENDRIN
0.10U	UG/L	ENDOSULFAN II (BETA)
0.10U	UG/L	4,4'-DDD (P,P'-DDD)
0.10U	UG/L	ENDOSULFAN SULFATE
0.10U	UG/L	4,4'-DDT (P,P'-DDT)
0.50U	UG/L	METHOXYCHLOR
0.10U	UG/L	ENDRIN KETONE
0.10U	UG/L	ENDRIN ALDEHYDE
0.050U	UG/L	ALPHA-CHLORDANE /2
0.050U	UG/L	GAMMA-CHLORDANE /2
5.0U	UG/L	TOXAPHENE
1.0UR	UG/L	PCB-1016 (AROCLOR 1016)
2.0U	UG/L	PCB-1221 (AROCLOR 1221)
1.0U	UG/L	PCB-1232 (AROCLOR 1232)
1.0U	UG/L	PCB-1242 (AROCLOR 1242)
1.0U	UG/L	PCB-1248 (AROCLOR 1248)
1.0U	UG/L	PCB-1254 (AROCLOR 1254)
1.0U	UG/L	PCB-1260 (AROCLOR 1260)

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3679 FY 1997 Project: 97-0171

PESTICIDES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF
Id/Station: MW3A
Media: GROUNDWA

Case Number: 25349
MD Number: ME69
D Number: ME69

Inorg Contractor: INCHVT
Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/12/97 15:15
Ending:

RESULTS	UNITS	ANALYTE
0.050U	UG/L	ALPHA-BHC
0.050U	UG/L	BETA-BHC
0.050U	UG/L	DELTA-BHC
0.050U	UG/L	GAMMA-BHC (LINDANE)
0.050U	UG/L	HEPTACHLOR
0.050U	UG/L	ALDRIN
0.050U	UG/L	HEPTACHLOR EPOXIDE
0.050U	UG/L	ENDOSULFAN I (ALPHA)
0.10U	UG/L	DIELDRIN
0.10U	UG/L	4,4'-DDE (P,P'-DDE)
0.10U	UG/L	ENDRIN
0.10U	UG/L	ENDOSULFAN II (BETA)
0.10U	UG/L	4,4'-DDD (P,P'-DDD)
0.10U	UG/L	ENDOSULFAN SULFATE
0.10U	UG/L	4,4'-DDT (P,P'-DDT)
0.50U	UG/L	METHOXYCHLOR
0.10U	UG/L	ENDRIN KETONE
0.10U	UG/L	ENDRIN ALDEHYDE
0.050U	UG/L	ALPHA-CHLORDANE /2
0.050U	UG/L	GAMMA-CHLORDANE /2
5.0U	UG/L	TOXAPHENE
1.0UR	UG/L	PCB-1016 (AROCLOR 1016)
2.0U	UG/L	PCB-1221 (AROCLOR 1221)
1.0U	UG/L	PCB-1232 (AROCLOR 1232)
1.0U	UG/L	PCB-1242 (AROCLOR 1242)
1.0U	UG/L	PCB-1248 (AROCLOR 1248)
1.0U	UG/L	PCB-1254 (AROCLOR 1254)
1.0U	UG/L	PCB-1260 (AROCLOR 1260)

A-average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc Indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3680 FY 1997 Project: 97-0171

PESTICIDES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: MW3 MD Number: ME70 Inorg Contractor: INCHVT
Media: GROUNDWA D Number: ME70 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/12/97 18:10
Ending:

RESULTS	UNITS	ANALYTE
0.050U	UG/L	ALPHA-BHC
0.050U	UG/L	BETA-BHC
0.050U	UG/L	DELTA-BHC
0.050U	UG/L	GAMMA-BHC (LINDANE)
0.050U	UG/L	HEPTACHLOR
0.050U	UG/L	ALDRIN
0.050U	UG/L	HEPTACHLOR EPOXIDE
0.050U	UG/L	ENDOSULFAN I (ALPHA)
0.10U	UG/L	DIELDRIN
0.10U	UG/L	4,4'-DDE (P,P'-DDE)
0.10U	UG/L	ENDRIN
0.10U	UG/L	ENDOSULFAN II (BETA)
0.10U	UG/L	4,4'-DDD (P,P'-DDD)
0.10U	UG/L	ENDOSULFAN SULFATE
0.10U	UG/L	4,4'-DDT (P,P'-DDT)
0.50U	UG/L	METHOXYCHLOR
0.10U	UG/L	ENDRIN KETONE
0.10U	UG/L	ENDRIN ALDEHYDE
0.050U	UG/L	ALPHA-CHLORDANE /2
0.050U	UG/L	GAMMA-CHLORDANE /2
5.0U	UG/L	TOXAPHENE
1.0UR	UG/L	PCB-1016 (AROCLOR 1016)
2.0U	UG/L	PCB-1221 (AROCLOR 1221)
1.0U	UG/L	PCB-1232 (AROCLOR 1232)
1.0U	UG/L	PCB-1242 (AROCLOR 1242)
1.0U	UG/L	PCB-1248 (AROCLOR 1248)
1.0U	UG/L	PCB-1254 (AROCLOR 1254)
1.0U	UG/L	PCB-1260 (AROCLOR 1260)

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3681 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

PESTICIDES SCAN

Collected By:

Beginning: 03/13/97 11:40

Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: LCP1 MD Number: ME71 Inorg Contractor: INCHVT

Media: SOIL D Number: ME71 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
2.4U	UG/KG	ALPHA-BHC
2.4U	UG/KG	BETA-BHC
2.4U	UG/KG	DELTA-BHC
2.4U	UG/KG	GAMMA-BHC (LINDANE)
2.4U	UG/KG	HEPTACHLOR
2.4U	UG/KG	ALDRIN
2.4U	UG/KG	HEPTACHLOR EPOXIDE
2.4U	UG/KG	ENDOSULFAN I (ALPHA)
4.6U	UG/KG	DIELDRIN
4.6U	UG/KG	4,4'-DDE (P,P'-DDE)
4.6U	UG/KG	ENDRIN
4.6U	UG/KG	ENDOSULFAN II (BETA)
4.6U	UG/KG	4,4'-DDD (P,P'-DDD)
4.6U	UG/KG	ENDOSULFAN SULFATE
4.6U	UG/KG	4,4'-DDT (P,P'-DDT)
24U	UG/KG	METHOXYCHLOR
4.6U	UG/KG	ENDRIN KETONE
4.6U	UG/KG	ENDRIN ALDEHYDE
2.4U	UG/KG	ALPHA-CHLORDANE /2
2.4U	UG/KG	GAMMA-CHLORDANE /2
240U	UG/KG	TOXAPHENE
46UR	UG/KG	PCB-1016 (AROCLOR 1016)
94U	UG/KG	PCB-1221 (AROCLOR 1221)
46U	UG/KG	PCB-1232 (AROCLOR 1232)
46U	UG/KG	PCB-1242 (AROCLOR 1242)
46U	UG/KG	PCB-1248 (AROCLOR 1248)
46U	UG/KG	PCB-1254 (AROCLOR 1254)
100	UG/KG	PCB-1260 (AROCLOR 1260)
29	%	% MOISTURE

A-average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample **3682** FY **1997** Project: **97-0171**

PESTICIDES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF
Id/Station: LCP3
Media: SOIL

Case Number: 25349
MD Number: ME72
D Number: ME72

Inorg Contractor: INCHVT
Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/13/97 12:15
Ending:

RESULTS	UNITS	ANALYTE
2.5U	UG/KG	ALPHA-BHC
2.5U	UG/KG	BETA-BHC
2.5U	UG/KG	DELTA-BHC
2.5U	UG/KG	GAMMA-BHC (LINDANE)
2.5U	UG/KG	HEPTACHLOR
2.5U	UG/KG	ALDRIN
2.5U	UG/KG	HEPTACHLOR EPOXIDE
2.5U	UG/KG	ENDOSULFAN I (ALPHA)
4.8U	UG/KG	DIELDRIN
4.8U	UG/KG	4,4'-DDE (P,P'-DDE)
4.8U	UG/KG	ENDRIN
4.8U	UG/KG	ENDOSULFAN II (BETA)
4.8U	UG/KG	4,4'-DDD (P,P'-DDD)
4.8U	UG/KG	ENDOSULFAN SULFATE
4.8U	UG/KG	4,4'-DDT (P,P'-DDT)
25U	UG/KG	METHOXYCHLOR
4.8U	UG/KG	ENDRIN KETONE
4.8U	UG/KG	ENDRIN ALDEHYDE
2.5U	UG/KG	ALPHA-CHLORDANE /2
2.5U	UG/KG	GAMMA-CHLORDANE /2
250U	UG/KG	TOXAPHENE
48UR	UG/KG	PCB-1016 (AROCLOR 1016)
97U	UG/KG	PCB-1221 (AROCLOR 1221)
48U	UG/KG	PCB-1232 (AROCLOR 1232)
48U	UG/KG	PCB-1242 (AROCLOR 1242)
48U	UG/KG	PCB-1248 (AROCLOR 1248)
48U	UG/KG	PCB-1254 (AROCLOR 1254)
48U	UG/KG	PCB-1260 (AROCLOR 1260)
31	%	% MOISTURE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3683 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

PESTICIDES SCAN

Collected By:

Beginning: 03/13/97 15:10

Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: EWN MD Number: ME73 Inorg Contractor: INCHVT

Media: LEACHATE D Number: ME73 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
0.050U	UG/L	ALPHA-BHC
0.050U	UG/L	BETA-BHC
0.050U	UG/L	DELTA-BHC
0.050U	UG/L	GAMMA-BHC (LINDANE)
0.050U	UG/L	HEPTACHLOR
0.050U	UG/L	ALDRIN
0.050U	UG/L	HEPTACHLOR EPOXIDE
0.050U	UG/L	ENDOSULFAN I (ALPHA)
0.10U	UG/L	DIELDRIN
0.10U	UG/L	4,4'-DDE (P,P'-DDE)
0.10U	UG/L	ENDRIN
0.10U	UG/L	ENDOSULFAN II (BETA)
0.10U	UG/L	4,4'-DDD (P,P'-DDD)
0.10U	UG/L	ENDOSULFAN SULFATE
0.10U	UG/L	4,4'-DDT (P,P'-DDT)
0.50U	UG/L	METHOXYCHLOR
0.10U	UG/L	ENDRIN KETONE
0.10U	UG/L	ENDRIN ALDEHYDE
0.050U	UG/L	ALPHA-CHLORDANE /2
0.050U	UG/L	GAMMA-CHLORDANE /2
5.0U	UG/L	TOXAPHENE
1.0UR	UG/L	PCB-1016 (AROCLOR 1016)
2.0U	UG/L	PCB-1221 (AROCLOR 1221)
1.0U	UG/L	PCB-1232 (AROCLOR 1232)
1.0U	UG/L	PCB-1242 (AROCLOR 1242)
4.8N	UG/L	PCB-1248 (AROCLOR 1248)
1.0U	UG/L	PCB-1254 (AROCLOR 1254)
16	UG/L	PCB-1260 (AROCLOR 1260)

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3676 FY 1997 Project: 97-0171

VOLATILES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: BW3

Media: GROUNDWA

Case Number: 25349

MD Number: ME66

D Number: ME66

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/11/97 13:43

Ending:

RESULTS	UNITS	ANALYTE
10U	UG/L	CHLOROMETHANE
10U	UG/L	BROMOMETHANE
10U	UG/L	VINYL CHLORIDE
10U	UG/L	CHLOROETHANE
10U	UG/L	METHYLENE CHLORIDE
10U	UG/L	ACETONE
10U	UG/L	CARBON DISULFIDE
10UR	UG/L	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
10U	UG/L	1,1-DICHLOROETHANE
10U	UG/L	1,2-DICHLOROETHENE (TOTAL)
10U	UG/L	CHLOROFORM
10U	UG/L	1,2-DICHLOROETHANE
10U	UG/L	METHYL ETHYL KETONE
10U	UG/L	1,1,1-TRICHLOROETHANE
10U	UG/L	CARBON TETRACHLORIDE
10U	UG/L	BROMODICHLOROMETHANE
10U	UG/L	1,2-DICHLOROPROPANE
10U	UG/L	CIS-1,3-DICHLOROPROPENE
10U	UG/L	TRICHLOROETHENE (TRICHLOROETHYLENE)
10U	UG/L	DIBROMOCHLOROMETHANE
10U	UG/L	1,1,2-TRICHLOROETHANE
10U	UG/L	BENZENE
10U	UG/L	TRANS-1,3-DICHLOROPROPENE
10U	UG/L	BROMOFORM
10U	UG/L	METHYL ISOBUTYL KETONE
10U	UG/L	METHYL BUTYL KETONE
10U	UG/L	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
10U	UG/L	1,1,2,2-TETRACHLOROETHANE
10U	UG/L	TOLUENE
10U	UG/L	CHLOROBENZENE
10U	UG/L	ETHYL BENZENE
10U	UG/L	STYRENE
10U	UG/L	TOTAL XYLENES

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3677 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

VOLATILES SCAN

Collected By:

Beginning: 03/12/97 12:30

Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: SD5 *MD Number:* ME67 *Inorg Contractor:* INCHVT

Media: SOIL D Number: ME67 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
27U	UG/KG	CHLOROMETHANE
27U	UG/KG	BROMOMETHANE
27U	UG/KG	VINYL CHLORIDE
27U	UG/KG	CHLOROETHANE
27U	UG/KG	METHYLENE CHLORIDE
33N	UG/KG	ACETONE
27U	UG/KG	CARBON DISULFIDE
27UR	UG/KG	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
27U	UG/KG	1,1-DICHLOROETHANE
27U	UG/KG	1,2-DICHLOROETHENE (TOTAL)
27U	UG/KG	CHLOROFORM
27U	UG/KG	1,2-DICHLOROETHANE
27U	UG/KG	METHYL ETHYL KETONE
27U	UG/KG	1,1,1-TRICHLOROETHANE
27U	UG/KG	CARBON TETRACHLORIDE
27U	UG/KG	BROMODICHLOROMETHANE
27U	UG/KG	1,2-DICHLOROPROPANE
27U	UG/KG	CIS-1,3-DICHLOROPROPENE
27U	UG/KG	TRICHLOROETHENE (TRICHLOROETHYLENE)
27U	UG/KG	DIBROMOCHLOROMETHANE
27U	UG/KG	1,1,2-TRICHLOROETHANE
27U	UG/KG	BENZENE
27U	UG/KG	TRANS-1,3-DICHLOROPROPENE
27U	UG/KG	BROMOFORM
27U	UG/KG	METHYL ISOBUTYL KETONE
27U	UG/KG	METHYL BUTYL KETONE
27U	UG/KG	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
27U	UG/KG	1,1,2,2-TETRACHLOROETHANE
27U	UG/KG	TOLUENE
27U	UG/KG	CHLOROBENZENE
27U	UG/KG	ETHYL BENZENE
27U	UG/KG	STYRENE
27U	UG/KG	TOTAL XYLENES
63	%	% MOISTURE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3678 FY 1997 Project: 97-0171

VOLATILES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: SW2 MD Number: ME68. Inorg Contractor: INCHVT

Media: SURFACEWA D Number: ME68 Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/12/97 13:15

Ending:

RESULTS	UNITS	ANALYTE
10U	UG/L	CHLOROMETHANE
10U	UG/L	BROMOMETHANE
10U	UG/L	VINYL CHLORIDE
10U	UG/L	CHLOROETHANE
10U	UG/L	METHYLENE CHLORIDE
10U	UG/L	ACETONE
10U	UG/L	CARBON DISULFIDE
10UR	UG/L	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
10U	UG/L	1,1-DICHLOROETHANE
10U	UG/L	1,2-DICHLOROETHENE (TOTAL)
10U	UG/L	CHLOROFORM
10U	UG/L	1,2-DICHLOROETHANE
10U	UG/L	METHYL ETHYL KETONE
10U	UG/L	1,1,1-TRICHLOROETHANE
10U	UG/L	CARBON TETRACHLORIDE
10U	UG/L	BROMODICHLOROMETHANE
10U	UG/L	1,2-DICHLOROPROPANE
10U	UG/L	CIS-1,3-DICHLOROPROPENE
10U	UG/L	TRICHLOROETHENE (TRICHLOROETHYLENE)
10U	UG/L	DIBROMOCHLOROMETHANE
10U	UG/L	1,1,2-TRICHLOROETHANE
10U	UG/L	BENZENE
10U	UG/L	TRANS-1,3-DICHLOROPROPENE
10U	UG/L	BROMOFORM
10U	UG/L	METHYL ISOBUTYL KETONE
10U	UG/L	METHYL BUTYL KETONE
10U	UG/L	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
10U	UG/L	1,1,2,2-TETRACHLOROETHANE
10U	UG/L	TOLUENE
10U	UG/L	CHLOROBENZENE
10U	UG/L	ETHYL BENZENE
10U	UG/L	STYRENE
10U	UG/L	TOTAL XYLENES

\-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
<-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3679 FY 1997 Project: 97-0171

VOLATILES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: MW3A MD Number: ME69 Inorg Contractor: INCHVT
Media: GROUNDWA D Number: ME69 Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/12/97 15:15
Ending:

RESULTS	UNITS	ANALYTE
10U	UG/L	CHLOROMETHANE
10U	UG/L	BROMOMETHANE
10U	UG/L	VINYL CHLORIDE
10U	UG/L	CHLOROETHANE
10U	UG/L	METHYLENE CHLORIDE
10U	UG/L	ACETONE
10U	UG/L	CARBON DISULFIDE
10UR	UG/L	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
10U	UG/L	1,1-DICHLOROETHANE
10U	UG/L	1,2-DICHLOROETHENE (TOTAL)
10U	UG/L	CHLOROFORM
10U	UG/L	1,2-DICHLOROETHANE
10U	UG/L	METHYL ETHYL KETONE
10U	UG/L	1,1,1-TRICHLOROETHANE
10U	UG/L	CARBON TETRACHLORIDE
10U	UG/L	BROMODICHLOROMETHANE
10U	UG/L	1,2-DICHLOROPROPANE
10U	UG/L	CIS-1,3-DICHLOROPROPENE
10U	UG/L	TRICHLOROETHENE (TRICHLOROETHYLENE)
10U	UG/L	DIBROMOCHLOROMETHANE
10U	UG/L	1,1,2-TRICHLOROETHANE
10U	UG/L	BENZENE
10U	UG/L	TRANS-1,3-DICHLOROPROPENE
10U	UG/L	BROMOFORM
10U	UG/L	METHYL ISOBUTYL KETONE
10U	UG/L	METHYL BUTYL KETONE
10U	UG/L	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
10U	UG/L	1,1,2,2-TETRACHLOROETHANE
10U	UG/L	TOLUENE
10U	UG/L	CHLOROBENZENE
10U	UG/L	ETHYL BENZENE
10U	UG/L	STYRENE
10U	UG/L	TOTAL XYLENES

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3680 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

VOLATILES SCAN

Collected By:
Beginning: 03/12/97 18:10
Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF
Case Number: 25349
Id/Station: MW3
MD Number: ME70
Inorg Contractor: INCHVT
Media: GROUNDWA
D Number: ME70
Org Contractor: IEA

RESULTS	UNITS	ANALYTE
10U	UG/L	CHLOROMETHANE
10U	UG/L	BROMOMETHANE
10U	UG/L	VINYL CHLORIDE
10U	UG/L	CHLOROETHANE
10U	UG/L	METHYLENE CHLORIDE
10U	UG/L	ACETONE
10U	UG/L	CARBON DISULFIDE
10UR	UG/L	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
10U	UG/L	1,1-DICHLOROETHANE
10U	UG/L	1,2-DICHLOROETHENE (TOTAL)
10U	UG/L	CHLOROFORM
10U	UG/L	1,2-DICHLOROETHANE
10U	UG/L	METHYL ETHYL KETONE
10U	UG/L	1,1,1-TRICHLOROETHANE
10U	UG/L	CARBON TETRACHLORIDE
10U	UG/L	BROMODICHLOROMETHANE
10U	UG/L	1,2-DICHLOROPROPANE
10U	UG/L	CIS-1,3-DICHLOROPROPENE
10U	UG/L	TRICHLOROETHENE (TRICHLOROETHYLENE)
10U	UG/L	DIBROMOCHLOROMETHANE
10U	UG/L	1,1,2-TRICHLOROETHANE
10U	UG/L	BENZENE
10U	UG/L	TRANS-1,3-DICHLOROPROPENE
10U	UG/L	BROMOFORM
10U	UG/L	METHYL ISOBUTYL KETONE
10U	UG/L	METHYL BUTYL KETONE
10U	UG/L	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
10U	UG/L	1,1,2,2-TETRACHLOROETHANE
10U	UG/L	TOLUENE
10U	UG/L	CHLOROBENZENE
10U	UG/L	ETHYL BENZENE
10U	UG/L	STYRENE
10U	UG/L	TOTAL XYLENES

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

OLATILES SAM ANALYSIS EPA - REGION IV SESD HENS, GA PRINTED 05/0[illegible] 15:52

Sample 3681 FY 1997 Project: 97-0171

VOLATILES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: LCP1

Media: SOIL

Case Number: 25349

MD Number: ME71

D Number: ME71

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/13/97 11:40

Ending:

RESULTS	UNITS	ANALYTE
14U	UG/KG	CHLOROMETHANE
14U	UG/KG	BROMOMETHANE
14U	UG/KG	VINYL CHLORIDE
14U	UG/KG	CHLOROETHANE
14U	UG/KG	METHYLENE CHLORIDE
14U	UG/KG	ACETONE
14U	UG/KG	CARBON DISULFIDE
14UR	UG/KG	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
14U	UG/KG	1,1-DICHLOROETHANE
14U	UG/KG	1,2-DICHLOROETHENE (TOTAL)
14U	UG/KG	CHLOROFORM
14U	UG/KG	1,2-DICHLOROETHANE
14U	UG/KG	METHYL ETHYL KETONE
14U	UG/KG	1,1,1-TRICHLOROETHANE
14U	UG/KG	CARBON TETRACHLORIDE
14U	UG/KG	BROMODICHLOROMETHANE
14U	UG/KG	1,2-DICHLOROPROPANE
14U	UG/KG	CIS-1,3-DICHLOROPROPENE
14U	UG/KG	TRICHLOROETHENE (TRICHLOROETHYLENE)
14U	UG/KG	DIBROMOCHLOROMETHANE
14U	UG/KG	1,1,2-TRICHLOROETHANE
14U	UG/KG	BENZENE
14U	UG/KG	TRANS-1,3-DICHLOROPROPENE
14U	UG/KG	BROMOFORM
14U	UG/KG	METHYL ISOBUTYL KETONE
14U	UG/KG	METHYL BUTYL KETONE
14U	UG/KG	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
14U	UG/KG	1,1,2,2-TETRACHLOROETHANE
14U	UG/KG	TOLUENE
14U	UG/KG	CHLOROBENZENE
14U	UG/KG	ETHYL BENZENE
14U	UG/KG	STYRENE
14U	UG/KG	TOTAL XYLENES
29	%	% MOISTURE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3682 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

VOLATILES SCAN

Collected By:
Beginning: 03/13/97 12:15
Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF   Case Number: 25349
Id/Station: LCP3   MD Number: ME72   Inorg Contractor: INCHVT
Media: SOIL   D Number: ME72   Org Contractor: IEA

RESULTS	UNITS	ANALYTE
14U	UG/KG	CHLOROMETHANE
14U	UG/KG	BROMOMETHANE
14U	UG/KG	VINYL CHLORIDE
14U	UG/KG	CHLOROETHANE
14U	UG/KG	METHYLENE CHLORIDE
84	UG/KG	ACETONE
14U	UG/KG	CARBON DISULFIDE
14UR	UG/KG	1,1-DICHLOROETHENE (1,1-DICHLOROETHYLENE)
14U	UG/KG	1,1-DICHLOROETHANE
14U	UG/KG	1,2-DICHLOROETHENE (TOTAL)
14U	UG/KG	CHLOROFORM
14U	UG/KG	1,2-DICHLOROETHANE
14U	UG/KG	METHYL ETHYL KETONE
14U	UG/KG	1,1,1-TRICHLOROETHANE
14U	UG/KG	CARBON TETRACHLORIDE
14U	UG/KG	BROMODICHLOROMETHANE
14U	UG/KG	1,2-DICHLOROPROPANE
14U	UG/KG	CIS-1,3-DICHLOROPROPENE
14U	UG/KG	TRICHLOROETHENE (TRICHLOROETHYLENE)
14U	UG/KG	DIBROMOCHLOROMETHANE
14U	UG/KG	1,1,2-TRICHLOROETHANE
14U	UG/KG	BENZENE
14U	UG/KG	TRANS-1,3-DICHLOROPROPENE
14U	UG/KG	BROMOFORM
14U	UG/KG	METHYL ISOBUTYL KETONE
14U	UG/KG	METHYL BUTYL KETONE
14U	UG/KG	TETRACHLOROETHENE (TETRACHLOROETHYLENE)
14U	UG/KG	1,1,2,2-TETRACHLOROETHANE
14U	UG/KG	TOLUENE
14U	UG/KG	CHLOROBENZENE
14U	UG/KG	ETHYL BENZENE
14U	UG/KG	STYRENE
14U	UG/KG	TOTAL XYLENES
31	%	% MOISTURE

\-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3666 FY 1997 Project: 97-0157
DIOXIN SCAN
Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC
Program: SSF SAS Number:DIOX
Id/Station: BW3
Media: WATER D Number: BW3 Org Contractor: SWOK

Printed by: John McConney
Collected By:
Beginning: 03/11/97 13:43
Ending:

RESULTS	UNITS	ANALYTE
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZODIOXIN
0.02UJ	NG/L	TETRACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
0.05UJ	NG/L	PENTACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEXACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEPTACHLORODIBENZODIOXIN (TOTAL)
0.11U	NG/L	OCTACHLORODIBENZODIOXIN
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZOFURAN
0.02UJ	NG/L	TETRACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,7,8-PENTACHLORODIBENZOFURAN
0.05UJ	NG/L	PENTACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
0.05UJ	NG/L	HEXACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
0.05UJ	NG/L	HEPTACHLORODIBENZOFURAN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZOFURAN
0	NG/L	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)

-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3667 FY 1997 Project: 97-0157

Printed by: John McConney

DIOXIN SCAN

Collected By:
Beginning: 03/12/97 12:30
Ending:

Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC
Program: SSF SAS Number:DIOX
Id/Station: SD5
Media: SOIL D Number: SD5 Org Contractor: SWOK

RESULTS	UNITS	ANALYTE
4.8U	NG/KG	2,3,7,8-TETRACHLORODIBENZODIOXIN
4.8UJ	NG/KG	TETRACHLORODIBENZODIOXIN (TOTAL)
12U	NG/KG	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
12UJ	NG/KG	PENTACHLORODIBENZODIOXIN (TOTAL)
12U	NG/KG	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
12U	NG/KG	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
12U	NG/KG	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
12UJ	NG/KG	HEXACHLORODIBENZODIOXIN (TOTAL)
12U	NG/KG	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
12UJ	NG/KG	HEPTACHLORODIBENZODIOXIN (TOTAL)
150	NG/KG	OCTACHLORODIBENZODIOXIN
4.8U	NG/KG	2,3,7,8-TETRACHLORODIBENZOFURAN
4.8UJ	NG/KG	TETRACHLORODIBENZOFURAN (TOTAL)
12U	NG/KG	1,2,3,7,8-PENTACHLORODIBENZOFURAN
12U	NG/KG	2,3,4,7,8-PENTACHLORODIBENZOFURAN
12UJ	NG/KG	PENTACHLORODIBENZOFURAN (TOTAL)
12U	NG/KG	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
12U	NG/KG	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
12U	NG/KG	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
12U	NG/KG	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
12UJ	NG/KG	HEXACHLORODIBENZOFURAN (TOTAL)
12U	NG/KG	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
12U	NG/KG	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
12UJ	NG/KG	HEPTACHLORODIBENZOFURAN (TOTAL)
24U	NG/KG	OCTACHLORODIBENZOFURAN
0.15	NG/KG	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)
58	%	% MOISTURE

-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3668 FY 1997 Project: 97-0157

Printed by: John McConney

DIOXIN SCAN

Collected By:

Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC

Beginning: 03/12/97 13:15

Ending:

Program: SSF SAS Number:DIOX

Id/Station: SW2

Media: WATER D Number: SW2 Org Contractor: SWOK

RESULTS	UNITS	ANALYTE
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZODIOXIN
0.02UJ	NG/L	TETRACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
0.05UJ	NG/L	PENTACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEXACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEPTACHLORODIBENZODIOXIN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZODIOXIN
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZOFURAN
0.02UJ	NG/L	TETRACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,7,8-PENTACHLORODIBENZOFURAN
0.05UJ	NG/L	PENTACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
0.05UJ	NG/L	HEXACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
0.05UJ	NG/L	HEPTACHLORODIBENZOFURAN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZOFURAN
0	NG/L	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)

average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3669 FY 1997 Project: 97-0157

DIOXIN SCAN

Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC
Program: SSF SAS Number:DIOX
Id/Station: MW3A
Media: WATER D Number: MW3A Org Contractor: SWOK

Printed by: John McConney
Collected By:
Beginning: 03/12/97 15:15
Ending:

RESULTS	UNITS	ANALYTE
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZODIOXIN
0.02UJ	NG/L	TETRACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
0.05UJ	NG/L	PENTACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEXACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEPTACHLORODIBENZODIOXIN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZODIOXIN
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZOFURAN
0.02UJ	NG/L	TETRACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,7,8-PENTACHLORODIBENZOFURAN
0.05UJ	NG/L	PENTACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
0.05UJ	NG/L	HEXACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
0.05UJ	NG/L	HEPTACHLORODIBENZOFURAN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZOFURAN
0	NG/L	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)

-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3670 FY 1997 Project: 97-0157
DIOXIN SCAN
Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC
Program: SSF SAS Number:DIOX
Id/Station: MW3
Media: WATER D Number: MW3 Org Contractor: SWOK

Printed by: John McConney
Collected By:
Beginning: 03/12/97 18:10
Ending:

RESULTS	UNITS	ANALYTE
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZODIOXIN
0.02UJ	NG/L	TETRACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
0.05UJ	NG/L	PENTACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEXACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEPTACHLORODIBENZODIOXIN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZODIOXIN
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZOFURAN
0.02UJ	NG/L	TETRACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,7,8-PENTACHLORODIBENZOFURAN
0.05UJ	NG/L	PENTACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
0.05UJ	NG/L	HEXACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
0.05UJ	NG/L	HEPTACHLORODIBENZOFURAN (TOTAL)
0.1U	NG/L	OCTACHLORODIBENZOFURAN
0	NG/L	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)

-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
:-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
:-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3671 FY 1997 Project: 97-0157
DIOXIN SCAN
Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC
Program: SSF SAS Number:DIOX
Id/Station:LCP1
Media: SOIL D Number: LCP1 Org Contractor: SWOK

Printed by: John McConney
Collected By:
Beginning: 03/13/97 11:40
Ending:

RESULTS	UNITS	ANALYTE
2.8U	NG/KG	2,3,7,8-TETRACHLORODIBENZODIOXIN
2.8UJ	NG/KG	TETRACHLORODIBENZODIOXIN (TOTAL)
7.0U	NG/KG	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
7.0UJ	NG/KG	PENTACHLORODIBENZODIOXIN (TOTAL)
7.0U	NG/KG	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
7.0U	NG/KG	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
7.0U	NG/KG	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
7.0UJ	NG/KG	HEXACHLORODIBENZODIOXIN (TOTAL)
7.0U	NG/KG	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
7.0UJ	NG/KG	HEPTACHLORODIBENZODIOXIN (TOTAL)
76	NG/KG	OCTACHLORODIBENZODIOXIN
2.8U	NG/KG	2,3,7,8-TETRACHLORODIBENZOFURAN
1.2J	NG/KG	TETRACHLORODIBENZOFURAN (TOTAL)
7.0U	NG/KG	1,2,3,7,8-PENTACHLORODIBENZOFURAN
7.0U	NG/KG	2,3,4,7,8-PENTACHLORODIBENZOFURAN
2.1J	NG/KG	PENTACHLORODIBENZOFURAN (TOTAL)
7.0U	NG/KG	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
7.0U	NG/KG	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
7.0U	NG/KG	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
7.0U	NG/KG	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
7.0UJ	NG/KG	HEXACHLORODIBENZOFURAN (TOTAL)
7.0U	NG/KG	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
7.0U	NG/KG	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
7.0UJ	NG/KG	HEPTACHLORODIBENZOFURAN (TOTAL)
14U	NG/KG	OCTACHLORODIBENZOFURAN
0.076	NG/KG	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)
29	%	% MOISTURE

verage value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
ctual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3672 FY 1997 Project: 97-0157

Printed by: John McConney

DIOXIN SCAN

Collected By:

Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC

Beginning: 03/13/97 12:15

Program: SSF SAS Number:DIOX

Ending:

Id/Station:LCP3

Media: SOIL D Number: LCP3 Org Contractor: SWOK

RESULTS	UNITS	ANALYTE
2.9U	NG/KG	2,3,7,8-TETRACHLORODIBENZODIOXIN
2.9UJ	NG/KG	TETRACHLORODIBENZODIOXIN (TOTAL)
7.4U	NG/KG	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
7.4UJ	NG/KG	PENTACHLORODIBENZODIOXIN (TOTAL)
7.4U	NG/KG	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
7.4U	NG/KG	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
7.4U	NG/KG	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
7.4UJ	NG/KG	HEXACHLORODIBENZODIOXIN (TOTAL)
7.4U	NG/KG	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
7.4UJ	NG/KG	HEPTACHLORODIBENZODIOXIN (TOTAL)
200	NG/KG	OCTACHLORODIBENZODIOXIN
2.9U	NG/KG	2,3,7,8-TETRACHLORODIBENZOFURAN
2.9UJ	NG/KG	TETRACHLORODIBENZOFURAN (TOTAL)
7.4U	NG/KG	1,2,3,7,8-PENTACHLORODIBENZOFURAN
7.4U	NG/KG	2,3,4,7,8-PENTACHLORODIBENZOFURAN
7.4UJ	NG/KG	PENTACHLORODIBENZOFURAN (TOTAL)
7.4U	NG/KG	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
7.4U	NG/KG	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
7.4U	NG/KG	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
7.4U	NG/KG	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
7.4UJ	NG/KG	HEXACHLORODIBENZOFURAN (TOTAL)
7.4U	NG/KG	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
7.4U	NG/KG	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
7.4UJ	NG/KG	HEPTACHLORODIBENZOFURAN (TOTAL)
12U	NG/KG	OCTACHLORODIBENZOFURAN
0.2	NG/KG	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)
32	%	% MOISTURE

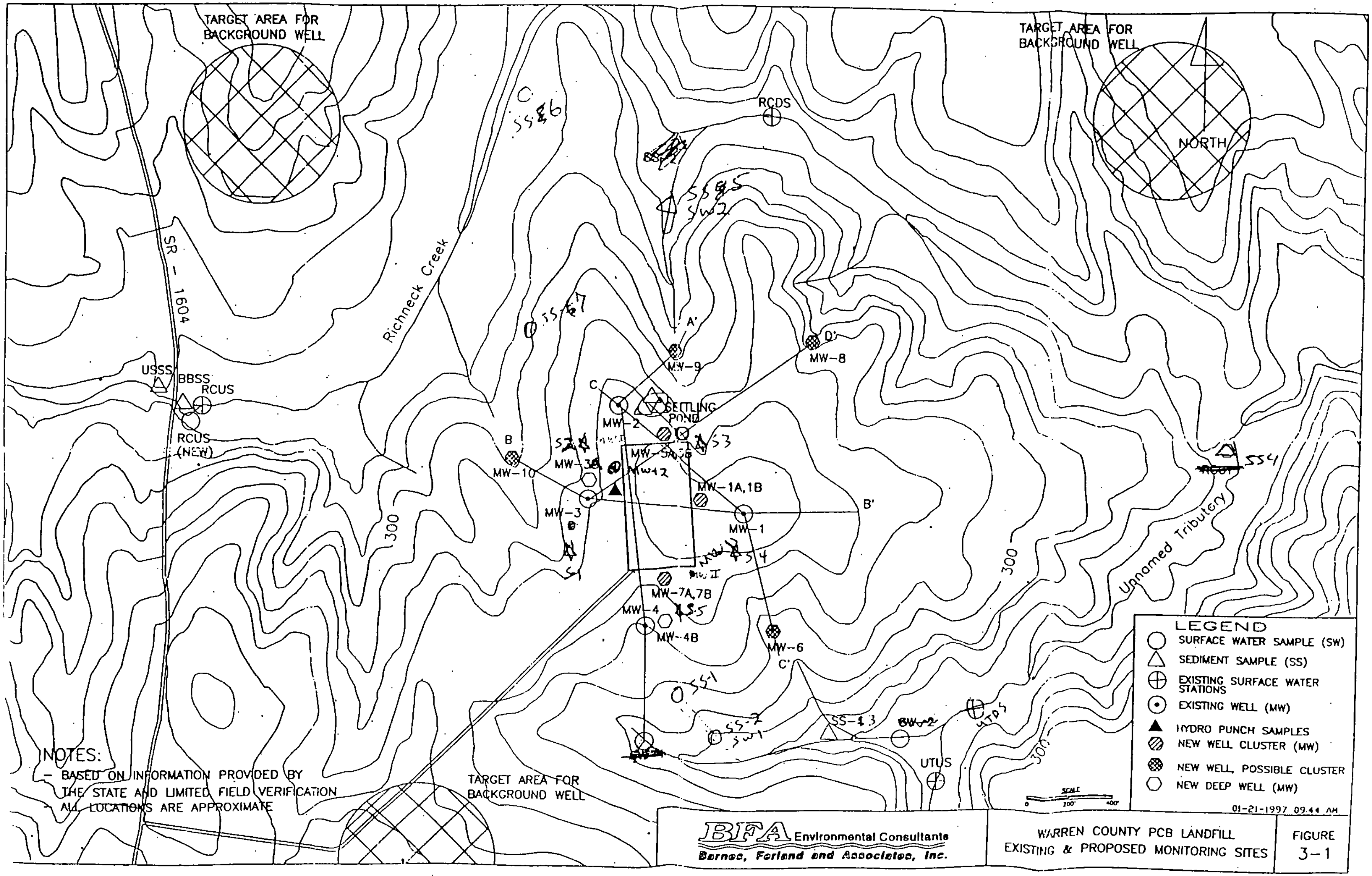
average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
confirmed by gcms: 1.when no value is reported, see chordane constituents 2.constituents or metabolites of technical chlordane

Sample 3673 FY 1997 Project: 97-0157
DIOXIN SCAN
Facility: WARREN CO PCB LANDFILL ROANOKE RAPIDS, NC
Program: SSF SAS Number:DIOX
Id/Station: EWN
Media: WATER D Number: EWN Org Contractor: SWOK

Printed by: John McConney
Collected By:
Beginning: 03/13/97 15:10
Ending:

RESULTS	UNITS	ANALYTE
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZODIOXIN
0.02UJ	NG/L	TETRACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZODIOXIN
0.05UJ	NG/L	PENTACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN
0.05UJ	NG/L	HEXACHLORODIBENZODIOXIN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN
0.09UJ	NG/L	HEPTACHLORODIBENZODIOXIN (TOTAL)
0.69	NG/L	OCTACHLORODIBENZODIOXIN
0.02U	NG/L	2,3,7,8-TETRACHLORODIBENZOFURAN
0.02UJ	NG/L	TETRACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,7,8-PENTACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,7,8-PENTACHLORODIBENZOFURAN
0.014J	NG/L	PENTACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN
0.05U	NG/L	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN
0.05U	NG/L	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN
0.016J	NG/L	HEXACHLORODIBENZOFURAN (TOTAL)
0.05U	NG/L	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN
0.013J	NG/L	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN
0.05UJ	NG/L	HEPTACHLORODIBENZOFURAN (TOTAL)
0.12	NG/L	OCTACHLORODIBENZOFURAN
0.0009J	NG/L	TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)

average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane



TARGET AREA FOR BACKGROUND WELL
TARGET AREA FOR BACKGROUND WELL
TARGET AREA FOR BACKGROUND WELL
NORTH
RCDS
SR - 1604
Richneck Creek
Unnamed Tributary
300
300
300
USSS
BBSS
RCUS
RCUS (NEW)
A'
MW-9
D'
MW-8
C
MW-2
SETTLING POND
MW-5A,5B
B
MW-10
MW-3B
MW-3
MW-1A,1B
MW-1
B'
MW-7A,7B
MW-4
MW-4B
MW-6
C'
SS-3
UTUS
UTDS
NOTES:
- BASED ON INFORMATION PROVIDED BY THE STATE AND LIMITED FIELD VERIFICATION
- ALL LOCATIONS ARE APPROXIMATE
LEGEND
SURFACE WATER SAMPLE (SW)
SEDIMENT SAMPLE (SS)
EXISTING SURFACE WATER STATIONS
EXISTING WELL (MW)
HYDRO PUNCH SAMPLES
NEW WELL CLUSTER (MW)
NEW WELL, POSSIBLE CLUSTER
NEW DEEP WELL (MW)
SCALE
0
200'
400'
01-21-1997 09:44 AM
BFA Environmental Consultants
Barnes, Ferland and Associates, Inc.
WARREN COUNTY PCB LANDFILL
EXISTING & PROPOSED MONITORING SITES
FIGURE 3-1

RECEIPT FOR SAMPLES

EPA REGION 4
U.S. ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL SERVICES DIVIS
COLLEGE STATION ROAD
ATHENS, GEORGIA 30613-7799

PROJECT NO.: 97-0171

PROJECT NAME: Warren Co. Landfill Site

NAME & LOCATION OF FACILITY/SITE: Warren Co. Landfill Site, Warren Co., N.C.

note: working group #'s only on Coordinator field copy (white)

SAMPLERS: (SIGNATURE) Jon Vail

STATION NO.	1997 DATE	TIME	COMP	GRAB	STATION LOCATION/DESCRIPTION	NO. OF EPA CONTAINERS	SPLIT SAMPLES Y OR N	EPA SAMPLE TAG NO.'S/REMARKS	working Group #
BW3	3/11	1343		X	Background Well 3	5	Y	4A67501, 02, 03, 04, 05	PS
SD5	3/12	1230		X	Sediment location 5	4	Y	4A67506, 07, 08, 09	AR
SW2	3/12	1315		X	Surface Water 2 @ Sed Loc. 5	5	Y	4A67510, 11, 12, 13, 14	DJ
MW3A	3/12	1515		X	Monitor Well 3A (Deeper)	5	Y	4A67515, 16, 17, 18, 19	PAB
MW3	3/12	1810		X	Monitor Well 3 (Shallow)	5	Y	4A67520, 21, 22, 23, 24	BAB
LCP1	3/13	1140		X	Leachate Collection Pond 1	4	Y	4A67525, 26, 27, 28	LB
LCP3	3/13	1215		X	Leachate Collection Pond 3	4	Y	4A67529, 30, 31, 32	SLB
EWN	3/13	1510		X	Extraction Well North	5	Y	4A67533, 34, 35, 36, 37	EZM

Confidential codes for EPA verification only.

SPLIT SAMPLES TRANSFERRED BY:
(PRINT) Jonathan Vail
DATE 3/13/97
(SIGN) Jonathan Vail
TIME 1600

SPLIT SAMPLES RECEIVED BY ☑ OR DECLINED BY ☐ :
(PRINT) HARRY ZINN
(SIGN) Harry Zinn
TITLE ENVIRONMENTAL ENGINEER

DATE/TIME 3-13-97 16:00
TELEPHONE 919 733 2801 (313)

DISTRIBUTION: Original to Coordinator Field Files: Copy to Facility/Site Representative

☆ U.S. GOVERNMENT PRINTING OFFICE: 1990-531-617 (12/89)

No. 4 4167

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4, SCIENCE and ECOSYSTEMS SUPPORT DIVISION
ATHENS, GEORGIA 30605-2720

MAY 27 1997

4SES-EI

MEMORANDUM

SUBJECT: Transmittal: Report On Split Samples Collected At The Warren County Landfill Site, Warren County, North Carolina. SESD Project No: 97-0171 (RAS) & 97-0157 (Dioxin).

FROM: Jonathan Vail
Hazardous Waste Section

THRU: Archie Lee, Chief
Hazardous Waste Section

TO: Beverly Hudson, RPM
North Site Management Branch
Waste Management Division

During the week of March 10, 1997, split samples were collected when I conducted the Technical Systems Audit at the Warren County PCB Landfill Site. The following report of findings summarizes the results. A total of 8 samples were split: 1 leachate, 3 ground water, 1 surface water, 1 sediment and 2 soil samples. All of the above environmental media samples were collected, preserved, handled, and documented according to the requirements and procedures found in the USEPA, Region 4, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, (EISOPQAM)*, May, 1996.

The results indicate that low concentrations of PCBs and Dioxins were detected only in the landfill leachate, soil and sediment samples. However, no PCBs or Dioxins were found in the ground water or surface water samples. Table 1 lists the analytical data summary for the leachate, ground water and surface water and Table 2 lists the analytical data summary for the soil and sediment sample results. The laboratory data sheets are included as Appendix A. Also attached are copies of the site map and the Receipt For Samples which lists the samples that were split. On the far right side of the form are the working group's sample identification information.

Please call me at (706) 355-8611 if you have any questions or comments on this investigation.

Attachments

cc: Craig Brown, NSMB
Thoman, EIB

TABLE 1. ANALYTICAL DATA SUMMARY FOR LEACHATE; GROUND WATER AND SURFACE WATER SPLIT SAMPLES.
WARREN COUNTY PCB LANDFILL SITE, WARREN COUNTY, NORTH CAROLINA.

METALS SCAN

Analyte	Units	EWN LEACHATE 03/13/97 1510 Amount	Nte	MW3A GROUNDWA 03/12/97 1515 Amount	Nte	MW3 GROUNDWA 03/12/97 1810 Amount	Nte	BW3 GROUNDWA 03/11/97 1343 Amount	Nte	SW2 SURFACEWA 03/12/97 1315 Amount	Nte
ARSENIC	UG/L	9	J	--		--		--		--	
BARIUM	UG/L	270		96		46		290		37	
CADMIUM	UG/L	2	J	--		--		--		--	
COBALT	UG/L	20	J	4	J	--		4	J	--	
CHROMIUM	UG/L	6	J	69	J	--		31	J	--	
COPPER	UG/L	6	J	17	J	--		20	J	--	
NICKEL	UG/L	12	J	55		--		37	J	--	
LEAD	UG/L	61		--		--		--		--	
VANADIUM	UG/L	14	J	13	J	--		4	J	--	
ZINC	UG/L	35		44		--		76		2	J
ALUMINUM	UG/L	2800	J	3300	J	--		2400	J	94	J
MANGANESE	UG/L	1700		600		2	J	250		140	
CALCIUM	UG/L	87000		23000		2100		21000		6000	
MAGNESIUM	UG/L	48000		5600		1100		13000		2800	
IRON	UG/L	81000	J	6000	J	--		2600	J	570	J
SODIUM	UG/L	58000		15000		3900		19000		4700	
POTASSIUM	UG/L	35000		8400		2600		6900		1400	

EXTRACTABLES SCAN

Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte
1,4-DICHLOROBENZENE	UG/L	2	J	--		--		--		--	
DI-N-OCTYLPHTHALATE	UG/L	--		24	J	--		--		--	
(3-AND/OR 4-)METHYLPHENOL	UG/L	15		--		--		--		--	
PHENOL	UG/L	--		5	J	--		--		--	

EXTRACTABLES-Miscellaneous Compounds

Compound	Units	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte
15 UNIDENTIFIED COMPOUNDS	UG/L	--		400	J	--		--		--	
2 UNIDENTIFIED COMPOUNDS	UG/L	50	J	--		--		--		--	
6 UNIDENTIFIED COMPOUNDS	UG/L	--		--		--		90	J	--	
BENZENEACETIC ACID	UG/L	300	JN	--		--		--		--	
BENZENEPROPANOIC ACID	UG/L	4	JN	--		--		--		--	
CAPROLACTAM	UG/L	--		2000	JN	--		200	JN	--	
CARBOXYLIC ACIDS	UG/L	--		--		--		9	JN	--	
DIHYDROINDAZOLONE	UG/L	8	JN	--		--		--		--	
DIMETHYLPHENOL(NOT 2,4)	UG/L	20	JN	--		--		--		--	
OLEYL ALCOHOL	UG/L	--		3	JN	--		--		--	

PESTICIDES/PCB SCAN

Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte
PCB-1248 (AROCLOR 1248)	UG/L	4.8	N	--		--		--		--	
PCB-1260 (AROCLOR 1260)	UG/L	16		--		--		--		--	

DIOXINS SCAN

Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte	Amount	Nte
OCTACHLORODIBENZODIOXIN	NG/L	0.69		--		--		--		--	
PENTACHLORODIBENZOFURAN (TOTAL)	NG/L	0.014	J	--		--		--		--	
HEXACHLORODIBENZOFURAN (TOTAL)	NG/L	0.016	J	--		--		--		--	
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	NG/L	0.013	J	--		--		--		--	
OCTACHLORODIBENZOFURAN	NG/L	0.12		--		--		--		--	
TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89	NG/L	0.0009	J	0		0		0		0	

FOOTNOTES
-- -material was analyzed for but not detected. J -estimated value.
N -presumptive evidence of presence of material.

TABLE 2. ANALYTICAL DATA SUMMARY FOR SOIL AND SEDIMENT SPLIT SAMPLES.
WARREN COUNTY PCB LANDFILL SITE, WARREN COUNTY, NORTH CAROLINA.

		LCP1 SOIL 03/13/97 1140		LCP3 SOIL 03/13/97 1215		SD5 SEDIMENT 03/12/97 1230	
METALS SCAN							
Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte
ARSENIC	MG/KG	3.1		4.4		--	
BARIUM	MG/KG	40		50		130	
CADMIUM	MG/KG	1.4	JN	1.9	JN	0.81	J
COBALT	MG/KG	3.1	J	3.6	J	12	J
CHROMIUM	MG/KG	18	J	32	J	14	J
COPPER	MG/KG	13		21		18	
NICKEL	MG/KG	4.9		4.4	J	6.2	J
LEAD	MG/KG	8.6		14	J	8.4	
SELENIUM	MG/KG	0.94	J	--		--	
VANADIUM	MG/KG	80		130		53	
ZINC	MG/KG	120		78		34	
TOTAL MERCURY	MG/KG	--		--		0.29	
ALUMINUM	MG/KG	12000	J	23000	J	10000	J
MANGANESE	MG/KG	200		120		380	
CALCIUM	MG/KG	2300	J	530	J	1300	J
MAGNESIUM	MG/KG	500		700		1900	
IRON	MG/KG	30000		48000		21000	
SODIUM	MG/KG	--		--		190	
POTASSIUM	MG/KG	560		950		1300	
% MOISTURE	%	29		32		62	
EXTRACTABLES-Miscellaneous Compounds							
Compound	Units	Amount	Nte	Amount	Nte	Amount	Nte
1 UNIDENTIFIED COMPOUND	UG/KG	800	J	--		--	
4 UNIDENTIFIED COMPOUNDS	UG/KG	--		4000	J	--	
8 UNIDENTIFIED COMPOUNDS	UG/KG	--		--		10000	J
CARBOXYLIC ACIDS	UG/KG	300	JN	300	JN	4000	J
TETRAHYDRONAPHTHALENE	UG/KG	--		--		800	JN
PESTICIDES/PCB SCAN							
Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte
PCB-1260 (AROCLOR 1260)	UG/KG	100		--		--	
VOLATILES SCAN							
Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte
ACETONE	UG/KG	--		84		33	N
DIOXINS SCAN							
Analyte	Units	Amount	Nte	Amount	Nte	Amount	Nte
OCTACHLORODIBENZODIOXIN	NG/KG	76		200		150	
TETRACHLORODIBENZOFURAN (TOTAL)	NG/KG	1.2	J	--		--	
PENTACHLORODIBENZOFURAN (TOTAL)	NG/KG	2.1	J	--		--	
TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89	NG/KG	0.076		0.2		0.15	

FOOTNOTES
-- -material was analyzed for but not detected. J -estimated value.
N -presumptive evidence of presence of material.

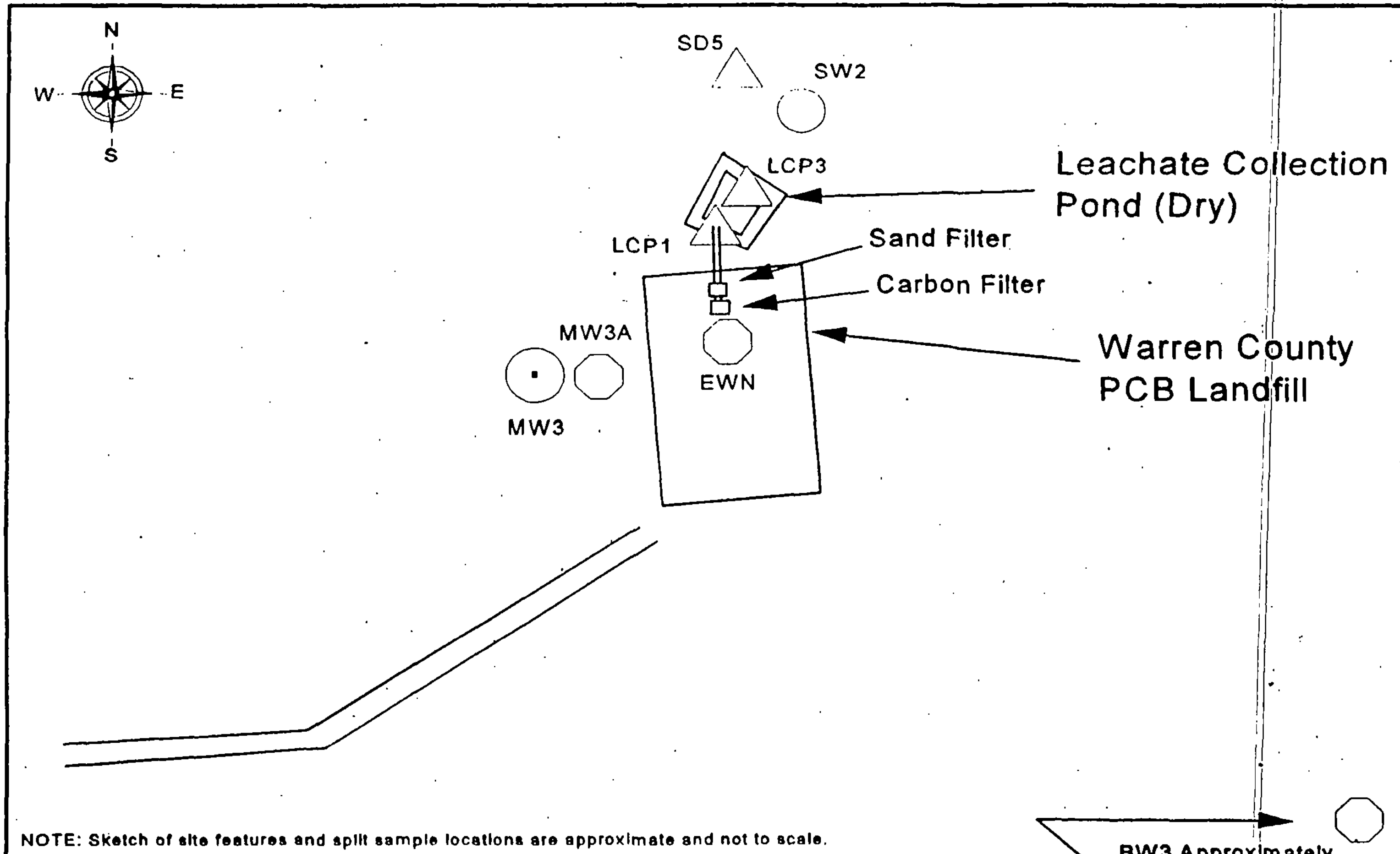


Figure 1. Split Sample Locations, Warren County PCB Landfill Site, Warren County, North Carolina.

APPENDIX A

LABORATORY DATA SHEETS
WARREN COUNTY PCB LANDFILL SITE
WARREN COUNTY, NORTH CAROLINA

Sample **3676** FY **1997** Project: **97-0171**

METALS SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF
Id/Station: BW3
Media: GROUNDWA

Case Number: 25349
MD Number: ME66
D Number: ME66

Inorg Contractor: INCHVT
Org Contractor: IEA

Printed by: John McConney
Collected By:
Beginning: 03/11/97 13:43
Ending:

RESULTS	UNITS	ANALYTE
2400J	UG/L	ALUMINUM
6U	UG/L	ANTIMONY
5U✓	UG/L	ARSENIC
290 ✓	UG/L	BARIUM
2U	UG/L	BERYLLIUM
1U✓	UG/L	CADMIUM
21000	UG/L	CALCIUM
31J✓	UG/L	CHROMIUM
4J	UG/L	COBALT
20J	UG/L	COPPER
2600J	UG/L	IRON
3U✓	UG/L	LEAD
13000	UG/L	MAGNESIUM
250	UG/L	MANGANESE
0.10U✓	UG/L	TOTAL MERCURY
37J	UG/L	NICKEL
6900	UG/L	POTASSIUM
3U✓	UG/L	SELENIUM
1U✓	UG/L	SILVER
19000	UG/L	SODIUM
4U	UG/L	THALLIUM
4J	UG/L	VANADIUM
76	UG/L	ZINC

-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

ETALS SAMPLE ALYSIS EPA - REGION IV SESD THENS, GA PRINTED 05/01/97 15:36

Sample 3677 FY 1997 Project: 97-0171

Printed by: John McConney

METALS SCAN

Collected By:

Beginning: 03/12/97 12:30

Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: SD5 = AR MD Number: ME67 Inorg Contractor: INCHVT

Media: SOIL D Number: ME67 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
10000J	MG/KG	ALUMINUM
1.8UJ	MG/KG	ANTIMONY
1.9U	MG/KG	ARSENIC
130	MG/KG	BARIUM
2U	MG/KG	BERYLLIUM
0.81J	MG/KG	CADMIUM
1300J	MG/KG	CALCIUM
14J	MG/KG	CHROMIUM
12J	MG/KG	COBALT
18	MG/KG	COPPER
21000	MG/KG	IRON
8.4	MG/KG	LEAD
1900	MG/KG	MAGNESIUM
380	MG/KG	MANGANESE
0.29	MG/KG	TOTAL MERCURY
6.2J	MG/KG	NICKEL
1300	MG/KG	POTASSIUM
1.4U	MG/KG	SELENIUM
0.79U	MG/KG	SILVER
190	MG/KG	SODIUM
2.2U	MG/KG	THALLIUM
53	MG/KG	VANADIUM
34	MG/KG	ZINC
62	%	% MOISTURE

-average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

METALS SAMPLE ANALYSIS | EPA - REGION IV SESD - ATHENS, GA | PRINTED 05/01/97 15:36

Sample 3678 FY 1997 Project: 97-0171

METALS SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: SW2 = DJ

Media: SURFACEWA

Case Number: 25349

MD Number: ME68

D Number: ME68

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: John McConney

Collected By:

Beginning: 03/12/97 13:15

Ending:

RESULTS	UNITS	ANALYTE
94J	UG/L	ALUMINUM
6U	UG/L	ANTIMONY
5U ✓	UG/L	ARSENIC
37 ✓	UG/L	BARIUM
1U	UG/L	BERYLLIUM
1U ✓	UG/L	CADMIUM
6000	UG/L	CALCIUM
1UJ ✓	UG/L	CHROMIUM
2U	UG/L	COBALT
1U	UG/L	COPPER
570J	UG/L	IRON
3U ✓	UG/L	LEAD
2800	UG/L	MAGNESIUM
140	UG/L	MANGANESE
0.10U ✓	UG/L	TOTAL MERCURY
3U	UG/L	NICKEL
1400	UG/L	POTASSIUM
3U ✓	UG/L	SELENIUM
1U ✓	UG/L	SILVER
4700	UG/L	SODIUM
4U	UG/L	THALLIUM
2U	UG/L	VANADIUM
2J	UG/L	ZINC

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3679 FY 1997 Project: 97-0171

Printed by: John McConney

METALS SCAN

Collected By:
Beginning: 03/12/97 15:15
Ending:

Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF Case Number: 25349
Id/Station: MW3A =PAB MD Number: ME69 Inorg Contractor: INCHVT
Media: GROUNDWA D Number: ME69 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
3300J	UG/L	ALUMINUM
6U	UG/L	ANTIMONY
5U	UG/L	ARSENIC
96	UG/L	BARIUM
1U	UG/L	BERYLLIUM
1U	UG/L	CADMIUM
23000	UG/L	CALCIUM
69J	UG/L	CHROMIUM
4J	UG/L	COBALT
17J	UG/L	COPPER
6000J	UG/L	IRON
3U	UG/L	LEAD
5600	UG/L	MAGNESIUM
600	UG/L	MANGANESE
0.10U	UG/L	TOTAL MERCURY
55	UG/L	NICKEL
8400	UG/L	POTASSIUM
3U	UG/L	SELENIUM
1U	UG/L	SILVER
15000	UG/L	SODIUM
4U	UG/L	THALLIUM
13J	UG/L	VANADIUM
44	UG/L	ZINC

A-average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

METALS SAMPLE ANALYSIS | EPA - REGION IV SESD - ATHENS, GA | PRINTED 05/01/97 15:36

Sample 3680 FY 1997 Project: 97-0171

METALS SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: MW3 = BAB

Media: GROUNDWA

Case Number: 25349

MD Number: ME70

D Number: ME70

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: John McConney

Collected By:

Beginning: 03/12/97 18:10

Ending:

RESULTS	UNITS	ANALYTE
9UJ	UG/L	ALUMINUM
6U	UG/L	ANTIMONY
5U ✓	UG/L	ARSENIC
46 ✓	UG/L	BARIUM
1U	UG/L	BERYLLIUM
1U ✓	UG/L	CADMIUM
2100	UG/L	CALCIUM
2UJ ✓	UG/L	CHROMIUM
1U	UG/L	COBALT
1U	UG/L	COPPER
20UJ	UG/L	IRON
3U ✓	UG/L	LEAD
1100	UG/L	MAGNESIUM
2J	UG/L	MANGANESE
0.10U ✓	UG/L	TOTAL MERCURY
3U	UG/L	NICKEL
2600	UG/L	POTASSIUM
3U ✓	UG/L	SELENIUM
1U ✓	UG/L	SILVER
3900	UG/L	SODIUM
4U	UG/L	THALLIUM
2U	UG/L	VANADIUM
2U	UG/L	ZINC

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3681 FY 1997 Project: 97-0171

METALS SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: LCP1 = LB

Media: SOIL

Case Number: 25349

MD Number: ME71

D Number: ME71

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: John McConney

Collected By:

Beginning: 03/13/97 11:40

Ending:

RESULTS	UNITS	ANALYTE
12000J	MG/KG	ALUMINUM
0.91UJ	MG/KG	ANTIMONY
3.1	MG/KG	ARSENIC
40	MG/KG	BARIUM
1U	MG/KG	BERYLLIUM
1.4JN	MG/KG	CADMIUM
2300J	MG/KG	CALCIUM
18J	MG/KG	CHROMIUM
3.1J	MG/KG	COBALT
13	MG/KG	COPPER
30000	MG/KG	IRON
8.6	MG/KG	LEAD
500	MG/KG	MAGNESIUM
200	MG/KG	MANGANESE
0.1U	MG/KG	TOTAL MERCURY
4.9	MG/KG	NICKEL
560	MG/KG	POTASSIUM
0.94J	MG/KG	SELENIUM
0.39U	MG/KG	SILVER
60U	MG/KG	SODIUM
1.1U	MG/KG	THALLIUM
80	MG/KG	VANADIUM
120	MG/KG	ZINC
29	%	% MOISTURE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

METALS SAMP' 'ANALYSIS EPA - REGION IV SES'-ATHENS, GA PRINTED 05/01/97 15:36

Sample 3682 FY 1997 Project: 97-0171

METALS SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: LCP3 ≈ SLB

Media: SOIL

Case Number: 25349

MD Number: ME72

D Number: ME72

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: John McConney

Collected By:

Beginning: 03/13/97 12:15

Ending:

RESULTS	UNITS	ANALYTE
23000J	MG/KG	ALUMINUM
0.99UJ	MG/KG	ANTIMONY
4.4 ✓	MG/KG	ARSENIC
50 ✓	MG/KG	BARIUM
1U	MG/KG	BERYLLIUM
1.9JN ✓	MG/KG	CADMIUM
530J	MG/KG	CALCIUM
32J ✓	MG/KG	CHROMIUM
3.6J	MG/KG	COBALT
21	MG/KG	COPPER
48000	MG/KG	IRON
14J ✓	MG/KG	LEAD
700	MG/KG	MAGNESIUM
120	MG/KG	MANGANESE
0.1U ✓	MG/KG	TOTAL MERCURY
4.4J	MG/KG	NICKEL
950	MG/KG	POTASSIUM
2U ✓	MG/KG	SELENIUM
0.42U ✓	MG/KG	SILVER
70U	MG/KG	SODIUM
1.2U	MG/KG	THALLIUM
130	MG/KG	VANADIUM
78	MG/KG	ZINC
32	%	% MOISTURE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3683 FY 1997 Project: 97-0171

METALS SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: EWN = EZM

Media: LEACHATE

Case Number: 25349

MD Number: ME73

D Number: ME73

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: John McConney

Collected By:

Beginning: 03/13/97 15:10

Ending:

RESULTS	UNITS	ANALYTE
2800J	UG/L	ALUMINUM
6U	UG/L	ANTIMONY
9J	UG/L	ARSENIC
270	UG/L	BARIUM
1U	UG/L	BERYLLIUM
2J	UG/L	CADMIUM
87000	UG/L	CALCIUM
6J	UG/L	CHROMIUM
20J	UG/L	COBALT
6J	UG/L	COPPER
81000J	UG/L	IRON
61	UG/L	LEAD
48000	UG/L	MAGNESIUM
1700	UG/L	MANGANESE
0.10U	UG/L	TOTAL MERCURY
12J	UG/L	NICKEL
35000	UG/L	POTASSIUM
5U	UG/L	SELENIUM
1U	UG/L	SILVER
58000	UG/L	SODIUM
4U	UG/L	THALLIUM
14J	UG/L	VANADIUM
35	UG/L	ZINC

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

:XTRACTABLES 'IPLE ANALYSIS EPA - REGION IV SESD ""HENS, GA PRINTED 05/07/97 15:52

Sample 3676 FY 1997 Project: 97-0171
EXTRACTABLES SCAN
Facility: WARREN COUNTY PCB LANDFILL , NC
Program: NSF
Id/Station: BW3 = PS
Media: GROUNDWA

Case Number: 25349
MD Number: ME66
D Number: ME66

Inorg Contractor: INCHVT
Org Contractor: IEA

Printed by: Yolanda Brown
Collected By:
Beginning: 03/11/97 13:43
Ending:

RESULTS	UNITS	ANALYTE
10UR ✓	UG/L	PHENOL
10UJ ✓	UG/L	BIS(2-CHLOROETHYL) ETHER
10UR ✓	UG/L	2-CHLOROPHENOL
10UJ ✓	UG/L	1,3-DICHLOROBENZENE
10UJ ✓	UG/L	1,4-DICHLOROBENZENE
10UJ ✓	UG/L	1,2-DICHLOROBENZENE
10UR ✓	UG/L	2-METHYLPHENOL
10UJ ✓	UG/L	BIS(2-CHLOROISOPROPYL) ETHER
10UR	UG/L	✓(3-AND/OR 4-)METHYLPHENOL
10UJ ✓	UG/L	N-NITROSODI-N-PROPYLAMINE
10UJ ✓	UG/L	HEXACHLOROETHANE
10UJ ✓	UG/L	NITROBENZENE
10UJ ✓	UG/L	ISOPHORONE
10UR ✓	UG/L	2-NITROPHENOL
10UR ✓	UG/L	2,4-DIMETHYLPHENOL
10UR ✓	UG/L	BIS(2-CHLOROETHOXY)METHANE
10UR ✓	UG/L	2,4-DICHLOROPHENOL
10UJ ✓	UG/L	1,2,4-TRICHLOROBENZENE
10UJ ✓	UG/L	NAPHTHALENE
10UJ	UG/L	4-CHLOROANILINE
10UJ ✓	UG/L	HEXACHLOROBUTADIENE
10UR	UG/L	4-CHLORO-3-METHYLPHENOL
10UJ	UG/L	2-METHYLNAPHTHALENE
10UJ	UG/L	HEXACHLOROCYCLOPENTADIENE (HCCP)
10UR	UG/L	2,4,6-TRICHLOROPHENOL
25UR	UG/L	2,4,5-TRICHLOROPHENOL
10UJ	UG/L	2-CHLORONAPHTHALENE
25UJ	UG/L	2-NITROANILINE
10UJ	UG/L	DIMETHYL PHTHALATE
10UJ	UG/L	ACENAPHTHYLENE
10UJ	UG/L	2,6-DINITROTOLUENE
25UJ	UG/L	3-NITROANILINE
10UJ	UG/L	ACENAPHTHENE
25UR	UG/L	2,4-DINITROPHENOL
25UR	UG/L	4-NITROPHENOL
10UJ	UG/L	DIBENZOFURAN
10UJ	UG/L	2,4-DINITROTOLUENE
10UJ	UG/L	DIETHYL PHTHALATE

RESULTS	UNITS	ANALYTE
10UJ	UG/L	4-CHLOROPHENYL PHENYL ETHER
10UJ	UG/L	FLUORENE
25UJ	UG/L	4-NITROANILINE
25UR	UG/L	2-METHYL-4,6-DINITROPHENOL
10UJ	UG/L	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10UJ	UG/L	4-BROMOPHENYL PHENYL ETHER
10UJ	UG/L	HEXACHLOROBENZENE (HCB)
25UR	UG/L	PENTACHLOROPHENOL
10UJ	UG/L	PHENANTHRENE
10UJ	UG/L	ANTHRACENE
10UJ	UG/L	CARBAZOLE
10UJ	UG/L	DI-N-BUTYLPHTHALATE
10UJ	UG/L	FLUORANTHENE
10UJ	UG/L	PYRENE
10UJ	UG/L	BENZYL BUTYL PHTHALATE
10UJ	UG/L	3,3'-DICHLOROBENZIDINE
10UJ	UG/L	BENZO(A)ANTHRACENE
10UJ	UG/L	CHRYSENE
10UJ	UG/L	BIS(2-ETHYLHEXYL) PHTHALATE
10UJ	UG/L	DI-N-OCTYLPHTHALATE
10UJ	UG/L	BENZO(B AND/OR K)FLUORANTHENE
10UJ	UG/L	BENZO-A-PYRENE
10UJ	UG/L	INDENO (1,2,3-CD) PYRENE
10UJ	UG/L	DIBENZO(A,H)ANTHRACENE
10UJ	UG/L	BENZO(GHI)PERYLENE

HOLDING TIMES EXCEEDED(40 CFR 136,OCTOBER 26,1984)

A-average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3676 FY 1997 Project: 97-0171

Printed by: Yolanda Brown

MISCELLANEOUS COMPOUNDS

Collected By:

Facility: WARREN COUNTY PCB LANDFILL , NC

Beginning: 03/11/97 13:43

Ending:

Program: NSF Case Number: 25349

Id/Station: BW3 MD Number: ME66 Inorg Contractor: INCHVT

Media: GROUNDWA D Number: ME66 Org Contractor: IEA

RESULTS	UNITS	ANALYTE
200JN		CAPROLACTAM
9JN		CARBOXYLIC ACIDS
90J		6 UNIDENTIFIED COMPOUNDS

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

EXTRACTABLES SAMPLE ANALYSIS — EPA - REGION IV SESD ATHENS, GA — PRINTED 05/07/97 15:52

Sample 3677 FY 1997 Project: 97-0171

EXTRACTABLES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF

Id/Station: SD5 = AR

Media: SOIL

Case Number: 25349

MD Number: ME67

D Number: ME67

Inorg Contractor: INCHVT

Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/12/97 12:30

Ending:

RESULTS	UNITS	ANALYTE
890UJ	UG/KG	PHENOL
890UJ	UG/KG	BIS(2-CHLOROETHYL) ETHER
890UJ	UG/KG	2-CHLOROPHENOL
890UJ	UG/KG	1,3-DICHLOROBENZENE
890UJ	UG/KG	1,4-DICHLOROBENZENE
890UJ	UG/KG	1,2-DICHLOROBENZENE
890UJ	UG/KG	2-METHYLPHENOL
890UJ	UG/KG	BIS(2-CHLOROISOPROPYL) ETHER
890UJ	UG/KG	(3-AND/OR 4-)METHYLPHENOL
890UJ	UG/KG	N-NITROSODI-N-PROPYLAMINE
890UJ	UG/KG	HEXACHLOROETHANE
890UJ	UG/KG	NITROBENZENE
890UJ	UG/KG	ISOPHORONE
890UJ	UG/KG	2-NITROPHENOL
890UJ	UG/KG	2,4-DIMETHYLPHENOL
890UR	UG/KG	BIS(2-CHLOROETHOXY)METHANE
890UJ	UG/KG	2,4-DICHLOROPHENOL
890UJ	UG/KG	1,2,4-TRICHLOROBENZENE
890UJ	UG/KG	NAPHTHALENE
890UJ	UG/KG	4-CHLOROANILINE
890UJ	UG/KG	HEXACHLOROBUTADIENE
890UJ	UG/KG	4-CHLORO-3-METHYLPHENOL
890UJ	UG/KG	2-METHYLNAPHTHALENE
890UJ	UG/KG	HEXACHLOROCYCLOPENTADIENE (HCCP)
890UJ	UG/KG	2,4,6-TRICHLOROPHENOL
2200UJ	UG/KG	2,4,5-TRICHLOROPHENOL
890UJ	UG/KG	2-CHLORONAPHTHALENE
2200UJ	UG/KG	2-NITROANILINE
890UJ	UG/KG	DIMETHYL PHTHALATE
890UJ	UG/KG	ACENAPHTHYLENE
890UJ	UG/KG	2,6-DINITROTOLUENE
2200UJ	UG/KG	3-NITROANILINE
890UJ	UG/KG	ACENAPHTHENE
2200UJ	UG/KG	2,4-DINITROPHENOL
2200UJ	UG/KG	4-NITROPHENOL
890UJ	UG/KG	DIBENZOFURAN
890UJ	UG/KG	2,4-DINITROTOLUENE
890UJ	UG/KG	DIETHYL PHTHALATE
890UJ	UG/KG	4-CHLOROPHENYL PHENYL ETHER
890UJ	UG/KG	FLUORENE
2200UJ	UG/KG	4-NITROANILINE
2200UJ	UG/KG	2-METHYL-4,6-DINITROPHENOL
890UJ	UG/KG	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
890UJ	UG/KG	4-BROMOPHENYL PHENYL ETHER
890UJ	UG/KG	HEXACHLOROBENZENE (HCB)
2200UJ	UG/KG	PENTACHLOROPHENOL
890UJ	UG/KG	PHENANTHRENE
890UJ	UG/KG	ANTHRACENE
890UJ	UG/KG	CARBAZOLE
890UJ	UG/KG	DI-N-BUTYLPHTHALATE
890UJ	UG/KG	FLUORANTHENE
890UJ	UG/KG	PYRENE
890UJ	UG/KG	BENZYL BUTYL PHTHALATE
890UJ	UG/KG	3,3'-DICHLOROBENZIDINE
890UJ	UG/KG	BENZO(A)ANTHRACENE
890UJ	UG/KG	CHRYSENE
890UJ	UG/KG	BIS(2-ETHYLHEXYL) PHTHALATE
890UJ	UG/KG	DI-N-OCTYLPHTHALATE
890UJ	UG/KG	BENZO(B AND/OR K)FLUORANTHENE
890UJ	UG/KG	BENZO-A-PYRENE
890UJ	UG/KG	INDENO (1,2,3-CD) PYRENE
890UJ	UG/KG	DIBENZO(A,H)ANTHRACENE
890UJ	UG/KG	BENZO(GHI)PERYLENE
63	%	% MOISTURE

EXCESSIVE HOLDING TIME

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3678 FY 1997 Project: 97-0171

EXTRACTABLES SCAN

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: SW2 MD Number: ME68 Inorg Contractor: INCHVT

Media: SURFACEWA D Number: ME68 Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/12/97 13:15

Ending:

RESULTS	UNITS	ANALYTE
10U	UG/L	PHENOL
10U	UG/L	BIS(2-CHLOROETHYL) ETHER
10U	UG/L	2-CHLOROPHENOL
10U	UG/L	1,3-DICHLOROBENZENE
10U	UG/L	1,4-DICHLOROBENZENE
10U	UG/L	1,2-DICHLOROBENZENE
10U	UG/L	2-METHYLPHENOL
10U	UG/L	BIS(2-CHLOROISOPROPYL) ETHER
10U	UG/L	(3-AND/OR 4-)METHYLPHENOL
10U	UG/L	N-NITROSODI-N-PROPYLAMINE
10U	UG/L	HEXACHLOROETHANE
10U	UG/L	NITROBENZENE
10U	UG/L	ISOPHORONE
10U	UG/L	2-NITROPHENOL
10U	UG/L	2,4-DIMETHYLPHENOL
10UR	UG/L	BIS(2-CHLOROETHOXY)METHANE
10U	UG/L	2,4-DICHLOROPHENOL
10U	UG/L	1,2,4-TRICHLOROBENZENE
10U	UG/L	NAPHTHALENE
10U	UG/L	4-CHLOROANILINE
10U	UG/L	HEXACHLOROBUTADIENE
10U	UG/L	4-CHLORO-3-METHYLPHENOL
10U	UG/L	2-METHYLNAPHTHALENE
10U	UG/L	HEXACHLOROCYCLOPENTADIENE (HCCP)
10U	UG/L	2,4,6-TRICHLOROPHENOL
25U	UG/L	2,4,5-TRICHLOROPHENOL
10U	UG/L	2-CHLORONAPHTHALENE
25U	UG/L	2-NITROANILINE
10U	UG/L	DIMETHYL PHTHALATE
10U	UG/L	ACENAPHTHYLENE
10U	UG/L	2,6-DINITROTOLUENE
25U	UG/L	3-NITROANILINE
10U	UG/L	ACENAPHTHENE
25U	UG/L	2,4-DINITROPHENOL
25U	UG/L	4-NITROPHENOL
10U	UG/L	DIBENZOFURAN
10U	UG/L	2,4-DINITROTOLUENE
10U	UG/L	DIETHYL PHTHALATE

RESULTS	UNITS	ANALYTE
10U	UG/L	4-CHLOROPHENYL PHENYL ETHER
10U	UG/L	FLUORENE
25U	UG/L	4-NITROANILINE
25U	UG/L	2-METHYL-4,6-DINITROPHENOL
10U	UG/L	N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10U	UG/L	4-BROMOPHENYL PHENYL ETHER
10U	UG/L	HEXACHLOROBENZENE (HCB)
10U	UG/L	PENTACHLOROPHENOL
10U	UG/L	PHENANTHRENE
10U	UG/L	ANTHRACENE
10U	UG/L	CARBAZOLE
10U	UG/L	DI-N-BUTYLPHTHALATE
10U	UG/L	FLUORANTHENE
10U	UG/L	PYRENE
10U	UG/L	BENZYL BUTYL PHTHALATE
10U	UG/L	3,3'-DICHLOROBENZIDINE
10U	UG/L	BENZO(A)ANTHRACENE
10U	UG/L	CHRYSENE
10U	UG/L	BIS(2-ETHYLHEXYL) PHTHALATE
10U	UG/L	DI-N-OCTYLPHTHALATE
10U	UG/L	BENZO(B AND/OR K)FLUORANTHENE
10U	UG/L	BENZO-A-PYRENE
10U	UG/L	INDENO (1,2,3-CD) PYRENE
10U	UG/L	DIBENZO(A,H)ANTHRACENE
10U	UG/L	BENZO(GHI)PERYLENE

A-average value. NA-not analyzed. NAI-interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

Sample 3677 FY 1997 Project: 97-0171

MISCELLANEOUS COMPOUNDS

Facility: WARREN COUNTY PCB LANDFILL , NC

Program: NSF Case Number: 25349

Id/Station: SD5 MD Number: ME67 Inorg Contractor: INCHVT

Media: SOIL D Number: ME67 Org Contractor: IEA

Printed by: Yolanda Brown

Collected By:

Beginning: 03/12/97 12:30

Ending:

RESULTS	UNITS	ANALYTE
800JN		TETRAHYDRONAPHTHALENE
4000J		CARBOXYLIC ACIDS
10000J		8 UNIDENTIFIED COMPOUNDS

A-average value. NA-not analyzed. NAI-Interferences. J-estimated value. N-presumptive evidence of presence of material.
K-actual value is known to be less than value given. L-actual value is known to be greater than value given. U-material was analyzed for but not detected. the number is the minimum quantitation limit.
R-qc indicates that data unusable. compound may or may not be present. resampling and reanalysis is necessary for verification.
C-confirmed by gcms: 1.when no value is reported, see chlordane constituents 2.constituents or metabolites of technical chlordane

SCIENCE ADVISORS' RESPONSE
TO STATE REVIEW
(Presented in no Particular Order)

State Issue: There is no evidence of PCB contamination outside the facility, the data obtained from the monitoring wells 5D and 1A is highly suspect and that there is no evidence that the facility has lost any integrity.

Response: The State's comment that "There is not one piece of evidence for PCB contamination outside the landfill" is in contradiction to their earlier statement that PCBs were found at the concentration of .1 ppm in the collection pond.

It does not make sense for the State to agree that water is possibly entering the facility but not escaping from it. Because the water which enters the landfill through the upper 10 mil liner and 2' of clay has a maximum driving head of 3 ft., while the driving force on the bottom liner system is as much as five times greater. Even though the bottom system, as shown in Figure 2.2, consists of five feet of clay instead of two with a 30-mil PVC liner, once flow conduits develop in the clay liner its laboratory permeability is completely meaningless. We know from the close examination of the upper PVC liner that some of the integrity loss is due to installation error (incomplete solvent welding). It is only logical to assume that similar problems occurred during the much more extensive welding which was required, under more adverse (steeper slope) conditions, for the bottom PVC liner.

Moreover, as discussed in the body of the investigation report vandalism of the bottom PVC liner necessitated an unusual amount of additional solvent welding.

The State's comment that there is no evidence that the landfill has lost its integrity contradicts their own admission that a part of the upper liner system (the 10 mil PVC liner) contains holes and root penetration. It is also a contradiction with their admission that the leachate collection system is inoperable. We believe proper functioning of both these landfill components is an important indication of the facilities integrity.

The strength in the analytical data indicating leakage is that it was detected where it would be expected, directly adjacent to the landfill in wells screened in the sapolite zone. If the wells in the draws had detected dioxins without a corresponding impact adjacent to the facility, I could understand the State's position. Of the 20 wells sampled and analyzed why would the highly suspect data results only originate from wells closest to the landfill? The question that should be asked is whether or not the State would consider similar concentrations in the background wells "highly suspect".

State Issue: The State has concluded that the seasonal water level changes can be explained by barometric pressure.

Response: The daily fluctuations of water levels in the landfill are no doubt tied to barometric pressure. The graph presented by the State clearly shows that relationship. The daily effects of barometric pressure on water levels has been documented for confined and semi-confined aquifers (Todd, 1980). It appears that the landfill system is possibly behaving as such a system. It is also possible that the daily fluctuations are due partly to how the relative difference between the compressibility of gas and water in the landfill saturated zone responds to atmospheric pressures.

Review of the State's recently provided barometric records, as well as similar records from 1992 through 1996, clearly indicate the increases and decreases in barometric pressures are strictly diurnal.

There is no consistent seasonal increase or decrease in barometric pressure. The sporadic changes are due to daily events. Because both the highest and lowest values occur in the colder months, it is doubtful that barometric pressure is controlling the seasonal pattern we have seen in the water levels at the facility.

Consistently, every year between December and June, water levels drop in the landfill. Using the State's explanation for the water level changes there should be a corresponding increase in atmospheric pressure between December and June of each year to force this drop in water levels. However, National Oceanic and Atmospheric Administration (NOAA) data downloaded from the Internet clearly shows no such seasonal correlation. Therefore, the consistent drop must be explained by another means. We know that it is not evaporation because the system is capped. It is our strong belief that the data support leakage as the only reasonable explanation for the seasonal drop in the landfill water level. The State makes no attempt to explain the perfect alignment of the hydrographs of both the wells inside and outside the facility, which is further evidence for a connection to the site's natural hydroperiod. The time period between peaks and valleys for both hydrographs are the same (six months). This pattern can only be explained by fixed pathways that have developed in the bottom liner system, which allows a certain amount of annual leakage to occur. We concur that landfill runoff and evapotranspiration probably exceed rainfall in summer months. But as stated earlier, the rise in water is due to percolation, which occurs in winter months.

State Issue: The State asks how could measured water levels be increasing if the most recent water levels for August, 1997 is the lowest in the last 100 years.

Response: Because of the time it takes for water to percolate through the upper liner system (approximately 4 to 6 months) it is not unusual that water levels are rising in the facility when precipitation is low.

The hydrograph presented in the report as Figure 4-9 clearly shows maximum water levels six months after a peak rainfall period. It is also important to look at the cumulative rainfall quantities not just a single month. The highest water levels recorded this summer can be tied to the very wet winter last year.

State Issue: The need for additional analysis to support the theory presented by the Science Advisors on the delayed rise of the landfill water table. The State also believes that a better value could be obtained for the water leakage rate into the facility.

Response: The Science Advisors do not believe additional analysis is warranted at this time. The water levels clearly show the results of a delayed rise. No amount of analysis could feasibly identify all the apertures in the liner, which allow water to enter and leave the system. With respect to better quantification of the leakage rate, additional review of the new geotechnical data suggest that if anything, the leakage rate is higher and the volume of water contained in the facility greater.

State Issue: On the criticism that the leachate collection system did not include a conventional perforated piping arrangement to facilitate the collection of leachate, as the original design indicated, the State maintained that the EPA approved the final design without this component and that the public was provided information about this change.

Response: All attempts to obtain documents that would verify that the EPA knowingly and intentionally approved a change in the landfill design to omit the perforated pipe system has proved unsuccessful. No document has ever surfaced that provided any technical justification for omitting the perforated pipe system. The Science Advisors believe that the omission of the perforated pipe system is an important factor explaining both the large amount of water in the landfill and the dysfunctional leachate collection system which the EPA has said places the landfill in noncompliance with federal requirements.

State Issue: The state asserted that the dioxin data are "inconclusive" and "highly suspect" for several reasons, including a "probable contamination problem in the laboratory."

Response: Without informing the Working Group or the Science Advisors, the Division of Waste Management contracted a company to review and analyze some parts of the data obtained for dioxins and furans. If the State had concerns about the quality of the dioxin data, the first logical stop would have been to raise concerns with the testing laboratory. It also would have been fair if the State had given the Science Advisors an opportunity to define the scope of work for the contractor study. The Science Advisors have subsequently requested the State to provide its questions to the laboratory. The questions posed by the Science Advisors were designed to obtain the testing laboratory's reactions to key aspects of the contractor's analyses, findings, and conclusions. However, at this time, the Science Advisors see no reason to change its main conclusions regarding the dioxin data. The Science Advisors acknowledged that some dioxins/furans were found in virtually all samples and that a distinction had to be made between generally detected low levels versus genuine high levels. Indeed, this site investigation report concluded that there were only two cases where the findings of dioxin were so high as to constitute a true and accurate finding of landfill contaminants outside the landfill.

The contractor study only considered two out of the 17 measurements made for each sample for specific chemical species, and for those two species (HPCDD and OCCD) concluded that there was major laboratory contamination affecting the results. Interestingly, the two species considered were not furans, which are generally more important than dioxins for PCB impurities. Nor did the contractor consider TEQ levels, which are the main way that the dioxin/furan data have been evaluated. Importantly, for one of the two samples that this investigation report concluded represented evidence of landfill leakage, the contractor study agreed that the data were accurate and reliable. For the other sample, the contractor analysis was essentially irrelevant (because the two species examined were not significant) and the report did not deny the accuracy or reliability of the high level of 2,3,7,8 TCDD that was found and which according to EPA rules is to be considered a positive finding.

It should be understood by readers of this investigation report that the State clearly has the goal of refuting the general conclusion that the landfill is leaking and, therefore, has attacked the dioxin data to support its position. It should also be noted that the contractor study found 13 cases for eight samples of reliable dioxin/furan results that could not be attacked as being unreliable. Even the critical contractor study could not deny the reliability of the observed dioxin contamination (for the two species examined) in four out of six samples of landfill soils, one of the landfill leachate samples, two background surface soil samples, and one of the offsite groundwater wells, for example.

It is also the opinion of the Science Advisors that the State's contractor used overly critical and unusual criteria to decide that so much of the dioxin data was unreliable. It did this through two means. First, it applied a criterion that only measured levels ten times above blank levels could be considered legitimate (i.e., a 10x rule), which is ascribed to EPA Region 4 guidance. But this guidance is not generally used in the United States. For example, Triangle Laboratories, often considered the premier dioxin testing laboratory in the country (but which the State did not give the contract to for testing in the site investigation because of higher costs than the laboratory it is now criticizing), notifies its clients that: 1) sample levels are above 20 times the blank level are valid; 2) sample levels between 5 and 20 times the blank level than the sample levels should be considered estimated; and 3) samples levels less than 5 times the blank level should be considered present likely due to laboratory contamination. These decision rules would invalidate fewer results than the rule applied by the State contractor. Second, the State contractor used a criterion that invalidated any sample result that was less than 10 times the highest blank level found among the whole set of samples and blanks. This is highly unusual, because laboratory blanks are run for batches of samples tested in the laboratory at different times or in different equipment. Only the batch blank is really relevant. Using the State's contractor's logic, one could use high blank levels obtained at any time in the testing laboratory to invalidate specific sample data. In fact, using the Triangle Laboratory approach, a much higher fraction of the dioxin data would be considered valid (i.e., unaffected by laboratory contamination). Again, it must be emphasized that nearly all of the dioxin data were NOT used to reach conclusions about finding contamination outside of the landfill, so that the State's contractor report's very negative conclusions are irrelevant.

State Issue: the State asserted that the lack of positive findings of PCBs outside the landfill support its view that there is no evidence that the landfill is leaking. The State asserted that if dioxins were found, then PCBs should also have been found. The State therefore concluded that there is no reliable evidence for concluding that the landfill is leaking.

Response: The Science Advisors find nothing unusual in the absence of positive findings of PCBs in the samples from outside the landfill, even in those samples where dioxins were found at genuinely high levels above background levels. The problem is that the detection limits for the PCB testing of water samples, performed in the State's laboratory, were not sufficiently low to detect very low levels, while the detection limits for the dioxin testing were exceptionally low. The Science Advisors have expressed their dissatisfaction with the quality of the data information provided by the State laboratory.

In other words, the very expensive dioxin testing could detect extremely low levels of dioxin, which probably originate as impurities in the PCBs, but the State PCB testing could not necessarily detect the corresponding low PCB levels in the water. In fact, only in two leachate samples were PCBs found by the State. The Science Advisors would have liked the State, in fairness, to have its contractor also review the quality of the State's PCB test data. In the view of the Science Advisors, the PCB testing was not of the highest quality that can be obtained from independent testing laboratories. The State has suggested the need for retesting of certain wells; if this were done, the Science Advisors strongly recommend that an independent laboratory be used for all testing, including dioxins and PCBs.

State Issue: To support its contention that the landfill is not leaking the State noted that the lower leachate collection system or leak detection zone "has never shown the presence of any water".

Response: The Science Advisors have no confidence that the lower leachate collection system has ever functioned efficiently and effectively. As EPA has certified, the main upper leachate collection system has not functioned properly and, therefore, there is no reason to believe that the lower system, based on essentially the same design, can be deemed reliable. Moreover, the leachate buildup inside the landfill could also be leaking through the sides of the landfill.

State Issue: The State's comments seem to imply that the State cannot agree with the logical connection made by the Science Advisors between the findings about landfill leakage and water building in the landfill with the clear regulatory noncompliance identified by EPA.

Response: It was the Science Advisors that caused EPA Region 4 to examine the question of regulatory compliance by the State, and eventually, EPA informed the State that it had not complied with several federal requirements, including: allowing extensive water in the landfill, not having a functioning leachate collection system, and not performing all the required monitoring. The Science Advisors find it entirely consistent that a landfill with an exceptionally large amount of water in it and without a functioning leachate collection system has leaked. Moreover, the Science Advisors also found evidence that the integrity of the top plastic liner was poor, so that there was a plausible means of water infiltration into the landfill. As expected, the State has referred to a contractor report by S&ME on the liner to support its view that the plastic liner is in "fair condition". This contractor report was strongly criticized by the Science Advisors when it was first produced and it was also discovered that the State had influenced its preparation and writing; the Science Advisors have no confidence in some of its conclusions. The State also supported its views by referring to the compact clay liner and its permeability. What the State fails to acknowledge, however, is that all such clay caps suffer from macroscopic defects that cause a much higher bulk or three dimensional permeability that is never revealed by laboratory testing of very small samples. The observation of tractor tread marks on the plastic liner also suggested relatively poor construction methods. The net effect of having a plastic liner with defects and a normal clay cap with macroscopic defects is that a relatively large amount of water infiltration is possible. The consultant report prepared for the State by Dr. Richardson also acknowledged significant water infiltration into the landfill, and it is interesting that the State comments on the draft site investigation report made no mention of this work requested by the State.

State Issue: The State has expressed its general disagreement with the conclusions reached about PCB air emissions. It has indicated that its methane monitoring results, for example, do not support the view of the Science Advisors that there has been actual PCB releases through the top cap system.

Response: One argument by the State is that they find it inconsistent that PCBs could be detected in one air sample but not others. The Science Advisors, however, believe that the positive finding of PCBs in that one air sample remains valid. Relatively small, discrete amounts of landfill gas in terms of puffs or belches can escape from relatively small defects in the top liner/cap systems and with variable wind conditions may only be detected in one sampler among many at the site. It seems that the State has conducted significant methane testing at the landfill, without however giving the Science Advisors any opportunity to review and comment on the methods used or to oversee the field testing. It then has interpreted the methane results to support its general view that the top liner/cap system has integrity. The Science Advisors, however, do not view the methane data as conclusive. In fact, the State finds itself in the same position with its methane results as with its PCB results. That is, out of all its testing only one sample showed methane in a sample above the top liner/cap system, and it ignored several samples where carbon dioxide was found, which is consistent with landfill gas releases. The Science Advisors have consistently said that PCB air releases from the landfill are difficult to detect through limited air testing. The State has found some very high levels of methane in the center vent and the two new landfill wells (north and south). High levels of over 30% methane seem unusual, because none of the materials extracted from the landfill have shown high levels of organic materials, which produce methane upon biological degradation. Such high methane levels are expected for conventional solid waste landfills with very high organic fractions. Because the Science Advisors have had no opportunity to review and inspect the methods and procedures used by State personnel, we have no confidence in the methane data. It should also be noted that the State's vent/wells methane data lack internal consistency, allowing wide variations from the same locations at different times, which the State has not actually explained.

State Issue: The State expressed disagreement with the investigation report's position about the potential importance of PCB variations on detoxification.

Response: The State noted that detoxification technologies are often used at sites with PCB levels greater than 10,000 ppm, much higher than found in the landfill. But this misses the practical engineering significance of having a cleanup site with widely varying PCB concentrations. The problem facing a cleanup contractor is how to make a number of decisions for various treatment parameters to ensure consistent effective detoxification sufficient to meet cleanup standards while maintaining the lowest possible operating costs. When PCB levels vary widely it may be prudent, for example, to ensure mixing of landfill contents to achieve a consistent average PCB level, rather than creating a situation where periodic surges in PCB levels can lead to process upsets or simply poor detoxification performance. Similarly, varying water content can also lead to a need for waste feed mixing to even out the input to the equipment.

PCB LANDFILL HYDROLOGY AND LINER LEAKAGE

By: Patrick A. Barnes, P.G.
PCB Landfill Working Group Science Advisor

General

In March, 1983, shortly following construction, the State reported that a significant amount of water had entered the landfill as a result of storm water events which had occurred during the construction process (September - November, 1982). By June, 1983, the State had removed 5,000 gallons of water through the leachate collection system. It is unclear whether the 5,000 gallons removed represented all the water thought to be in the landfill at that time or not. Over several subsequent years the State continued to remove small amounts of leachate through a largely inoperable collection system. Based on available data, the total leachate quantity removed is approximately 8,000 gallons. In 1993, the State reported that the landfill contained approximately 13.5 feet of water based on water level measurements made in the leachate collection system.

The increase stress on the bottom liner system coupled with several other complicating factors has apparently resulted in a breach of the bottom liner integrity. Additionally, either through normal wear, manufacturing defects or improper installation the upper composite liner of the landfill also appears to be breached.

Liner Design

Recent studies performed by Lee and Schroeder show that the composite liner system similar to that designed by the State for this facility has high leakage rates associated with it. The study evaluated six liner designs using the HELP model and found the most effective system included a drainage layer, followed by a synthetic liner, a low permeability soil layer, and additional drainage layer, synthetic liner, followed by a final soil layer. It concluded that composite liners where the synthetic liner is not in direct contact with the compacted clay layer are more likely to fail. The PCB landfill bottom liner system includes one foot of fill between the synthetic liner and the compacted clay layer.

The initial siting report indicates that the State made use of on-site clay materials in construction of the clay liners. Although this material would have been substantially reworked and compacted, the fact that this material comprised a portion of a thick section of material which was weathered in place implies that over time it will tend to form cracks and avenues for percolation.

The 30 mil synthetic bottom liner was severely damaged by vandalism during the early phases of construction. Some of these holes are depicted in pictures 1 through 12. Given the substantial nature of the vandalism, the State should have probably considered placing an additional synthetic liner above the damaged one rather than patching the damaged liner.

The top liner system includes a synthetic PVC liner in direct contact with a low permeability soil layer; however, the PVC liner is very thin (10 mils) this, in addition to the numerous problems which could arise from during manufacturing and installation, are reasons to suspect possible failure. Problems during construction (see pictures 1 through 12) may have also contributed to a loss of integrity.

Rainfall Occurrence

The monthly rainfall amounts for Warren County (Alcola) were reviewed to characterize its relationship to the monitoring well hydrographs and the leakage level fluctuations. The graph shows that the area receives a significant amount of rain consistently throughout the year with peaks in early spring and early summer. Rainfall for Alcola for the past four years is given on Figure 1. The peaks align quite well with the peaks in the water table hydrograph showing that precipitation recharges quite readily within the landfill area. This is particularly interesting because low permeability of the native clays was a significant factor in the State's decision to select the Warren County site. Based on review of this data it is apparent that, although the onsite clays have very low laboratory permeabilities, the effective permeability of those same sediments is actually much much higher.

The average rainfall per year for the Warren County area is approximately 45 inches. The area received approximately 9 inches of rain during the months of September, October and November, 1982. The period of time attributed to water inflow by the State. The 9 inches does approximate the 13 feet of water initially reported by the State. In 1995, which was a wet year, the average rainfall increased by over 10 inches, to 56 inches. Consistent with liner leakage, this increase in rainfall was also ultimately represented in a rise in landfill water level.

Monitoring Well Hydrograph

The obvious source of this rapid groundwater recharge is secondary porosity such as cracks in the native silty sand and clay layers. The effective recharge of precipitation as analyzed by at least a one year hydrograph is a necessary first step in the hydrogeologic evaluation of potential landfill sites, and was apparently not performed by the State prior to site selection. As would be expected, the rainfall variations match very well with the monitoring well hydrographs particularly for monitoring wells 2, 3 and 4. MW-1 appears to be partially plugged and does not respond in phase with the other wells.

Generally, it appears that significant rainfall events which occur during the early spring and late fall directly translates to a rise in groundwater levels while large rainfall events which occur during summer months go largely unnoticed in the groundwater system. This is due to the much higher evaporation which occurs during the summer months. The increase in evaporation in summer months is a very important part of the hydraulic cycle and as will be discussed later, plays an important role in the landfill water level hydrograph and the proposed leakage dynamics.

Another very interesting aspect of the monitoring well hydrographs when compared to both the landfill water level and the precipitation amounts, is that the general trend of the wells is towards decreasing water levels, while both precipitation and landfill water levels are increasing. The concurrent rise in rainfall amount and landfill water levels strongly indicates that precipitation and thus leakage is controlling the landfill's water level.

Landfill Water Level Hydrograph

As would be expected in a lined landfill, the peaks in landfill water level do not align with that of rainfall, instead they are shifted into the future on the leachate level graph (Figure 2). Although this behavior is slightly masked for several smaller peaks, the highest rainfall months recorded, March, 1993, 1994 and 1995 are consistently followed by peaks in the landfill water level six months later in September. A second peak in rainfall in June, 1995 is once again followed by a very high landfill water level peak six month's later in December. This regular pattern could not be coincidental. It obviously represents the period of time it takes water to travel through the top liner system eventually reaching the landfill water table.

With the exception of the six month shift in the hydrograph, the landfill water level is behaving as would be expected for any natural system in direct connection with the environment. It has a water balance as would be expected for any flow basin. This is particularly disturbing because the system was engineered to remain isolated from surface and groundwater influences. More importantly, perhaps, as will be discussed later is that the landfill water level has consistently rose during the period of record.

Leakage Dynamics

The various components of the landfill water level hydrograph can be explained as follows:

1. Quickly following large rainfall events the two foot layer of top soil becomes saturated and small amounts of rainfall seep through improperly seamed or worn areas of the upper synthetic liner. The majority of leakage through the upper liner probably occurs during periods of low evaporation when the soil above the liner can remain saturated for much longer periods following rainfall events. This increase in water level increases the threat to the environment by increasing the pressure on the bottom liner.

2. Percolation then occurs through the clay portions of the liner. Both by granular conveyance and through cracks this process takes approximately six months and is the major component in the offset between the landfill water level rise and monitoring well hydrograph rise.

3. Flow continues downward through the unsaturated landfill contents.

4. Typically, during the months of July though November, the water level within the landfill rises as a result of the leakage which occurred across the top liner during December through June. Significant leakage through the top liner does not occur within these months (July-November).

5. The resultant increase in pressure on the bottom liner attributed to the water level rise results in leakage across that composite liner (primarily during December through June) which subsequently decreases the water level within the landfill.

6. As Figure 2 indicates, the cycle repeats itself; however for the period of record more water enters than leaves the system, i.e., Qin>Qout. Although for several months at a time the reverse is true Qout>Qin.

Delayed Rise

As discussed, the rise in water levels within the landfill is approximately six months out of phase with the monitoring well hydrographs and rainfall data. This delay is primarily due to the effective permeability of the 10 mil PVC and 2 ft. thick clay top liner. It is believed that precipitation seeps readily through the 10 mil PVC liner via openings due to manufacture defects, improper seaming and installation and/or normal wear. Once under, this potential leakage water is protected from evaporation and can seep through the clay under condition of saturated flow, or through a system of fractures within the clay.

Using the groundwater velocity equation the leakage rate across the 24" clay layer can be estimated as follows:

$$V = \frac{KI}{\theta}$$

V = Velocity (length/day)
K = Permeability (length/day)
I = Gradient (ft/ft)
θ = Porosity (unitless)

$K = 10^{-7}$ cm/sec

$$I = \frac{dh}{dL} = \frac{2}{2} = 1$$

θ = .03 (Todd)

$$V = \frac{10^{-7}\text{cm/sec}(1)}{.03} = 3.33^{-6}\frac{\text{cm}}{\text{sec.}} \cdot \frac{1\text{ inch}}{2.54/\text{cm}} \cdot \frac{86{,}400\text{ sec.}}{\text{day}}$$

$$V = .1133\,\frac{\text{in.}}{\text{day}} \cdot \frac{180\text{ days}}{6\text{ months}} = \frac{20\text{ inches}}{6\text{ months}}$$

This fits very well with the approximate thickness of the clay top liner (24") indicating that even with a conservative permeability value (the one used by the State for the intact clay layer) water can be transferred as shown by the hydrograph within an approximate 6 month period.

Leakage Rate

Each season for the four years of record there is a rise in water level of approximately 12 inches followed by a drop of about 11 inches. This cyclical pattern has resulted in a net increase in water level over the period of approximately 1 foot. Because of improper documentation and reporting early on, it is difficult to say how much of the total volume of water present in the landfill originated from storm events and improper stormwater management.

However, we have already established that the effective permeability of the clay will allow transmission of water across it with the assumption that rain water readily passes through the synthetic liner through breaches.

It is assumed that the landfill materials have an average effective porosity (specific yield) of 5% or .05. The approximate 10 inch fluctuation observed over a six month period can be attributed to approximately 1/2 inch of leakage through the liner systems. For the period of record the landfill area experienced over 45 inches of rain per year, one-half of an inch of leakage represents only $\cong$ 1% of the total rainfall.

Volume of Landfill

The volume of the landfill can be approximated by calculating the area of a plane midway between the top and base of the landfill and multiplying it by the height. The mid point is equivalent to the average of the top area and the area of the base.

Top Area = 240' x 475' $\cong$ 114,000 ft.^{2}

Bottom Area = 100' x 300' = 30,000 ft.^{2}

Mid Point = 144,000/2 = 72,000 ft.^{2}

Volume = 72,000 ft.^{2} x 22 ft. =
$\cong$ 1,584,000 ft.^{3}

Volume of Water

The volume of initial water in the landfill can be calculated using the same general procedure and substituting the thickness (22 ft.) of the landfill material with the height of the 13 ft. water column. as follows:

Top Area (at Water Surface) = 400' x 175' = 70,000 ft.^{2}

Bottom Area = 100' x 300' = 30,000 ft.^{2}

Mid Point = 100,000 ft.^{2}/2 = 50,000 ft.^{2}

Volume = 50,000 ft.^{2} x 13 ft.
= 650,000 ft.^{3} x $\frac{7.58 \text{ gal.}}{\text{ft.}^3}$
= 4,862,000 gals. , .05 (specific yield)
= 243,100 gals.

The base elevation of the landfill is 320' MSL. If the initial height of water in the landfill was 13 feet as reported by the State, that would equate to an elevation of approximately 333 ft. In February, 1996 the average elevation was approximately 2.5 ft. higher at 335.5 ft. MSL. Since the water in the landfill was first reported, there has been an increase in the amount of water in the landfill by approximately 2.5 ft.

The current volume of water (Nov., 1996) in the landfill based on the historical rise in water level is estimated to be approximately 320,000 gal. (this includes an additional .2' of water level rise between February and November) which represents an increase of 77,000 gallons over the 14 year landfill life or an average net increase of approximately 5,500 gallons per year.

If it is assumed that during periods of landfill water level rise only very small amounts of water is being discharged, and if it is assumed that during periods of falling water levels that only slight amounts of new leakage is coming in, then the annual inflow and outflow of water to and from the landfill can be approximated as seen on Table 1.

Because of the shape of the landfill it is necessary once again to use an average area to estimate inflow and outflow. The surface area used is that of the landfill at elevation 335 ft. MSL. The estimated 3,000 gallon net increase in landfill water matches fairly well with the 5,500 gallon amount estimated based on the 2.5 ft. rise in water levels over the life of the facility, especially given that the State's initial height estimate was a rough estimate.

Table 1

Estimate Water Balance
Last 3 Years of Data

Discharge	Rise and Fall in Inches			Average Inches	Annual Leakage Volume
	Year 1	Year 2	Year 3		
Q Out Leakage	9 (.45)	12 (.60)	12 (.60)	11.0 (.55)	25,965 gallons (.55 in.)
Q In Leakage	12 (.60)	10 (.5)	15 (.75)	12.4 (.615)	29,033 gallons (.615 in.)

Note: The decimal given in the parentheses is the amount of leakage either in or out of the landfill which is required for the observed rise and fall in landfill water level (the number immediately above it).

Construction Process

It appears that the Contractors involved in the construction of the PCB Landfill were faced with several problems which could have compromised the integrity of the landfill from a very early date, not the least of which was weather and vandalism. We were unable to obtain copies of the field construction logs; however, pictures 1 through 12 show some of the construction related problems. They were obtained from the State's files.

As can be seen, the landfill was largely unprotected from precipitation which resulted in a significant inflow of rain water. Additionally, the top soil material appears to have been inappropriately selected and/or compacted which resulted in exposure of the top synthetic liner. The pressure build-up below the PVC top liner as shown in the attached pictures is strong evidence for the existence of fractures in the upper clay layer. These fractures would represent one avenue for possible downward leakage of precipitation.

The pictures also shows the vandalism discussed which may have also played a key role in the loss of lower liner integrity. It is uncertain why this liner was not replaced instead of repaired by the State contractors.

System Design & Leachate Management

The landfill system appears to be improperly designed in two key areas.

1. Top Liner System

   Pictures 11 and 12 show significant ripples in the top soil across the landfill surface. In several areas, these ripples resulted in the exposure of the PVC liner. These features may represent areas where surface water could pond and enhance percolation. The top liner should have been designed to minimize slumping and potential water ponding.

2. Leachate Collection System

   The leachate collection system which the State has indicated is largely inoperable, can only pump very small volumes at any given time and is improperly designed. A significant problem with the system design is the apparent absence of a perforated pipe extraction system. In order to effectively remove water from the silty soils present in the landfill, a much more extensive system of leachate collection encompassing a significant portion of the bottom area should have been employed.

   The soil present within the landfill originated on road shoulders throughout the State, typical road shoulder material is designed for stability meaning it is usually very poorly sorted. This does not appear to have been a consideration in the system design.

Monitoring

The State is currently in gross non-compliance with the TSCA monitoring requirements. No samples have been collected and analyzed from any of the four groundwater monitoring wells or four surface water stations since July, 1994. Based on documents reviewed dated June, 1983 and on the State's Operational Plan environmental samples were to be collected twice per year until otherwise stated by the EPA regional Administrator. The State has missed four consecutive sampling events.

Of particular concern to me is that the site only contains four monitoring wells which in my view are not only improperly located but also poorly designed. The surface water stations selected also appear to be dictated more by accessibility than environmental science.

The State was very much aware of the site hydrology and in fact used it heavily in the selection process. In the 1980 Environmental Impact Statement the landfill site's drainage is described as being controlled by six major draws around the landfill site. Given that statement, it is difficult to understand why no monitoring wells were placed directly at the head of any of these features. Also, after spending a significant amount of time in the field inspecting the hydrology of the site I find it incredible that no surface water samples have been collected at the several contact springs which surround the site. These features represent the most likely points of origination for any discharge which might result from the landfill bottom liner.

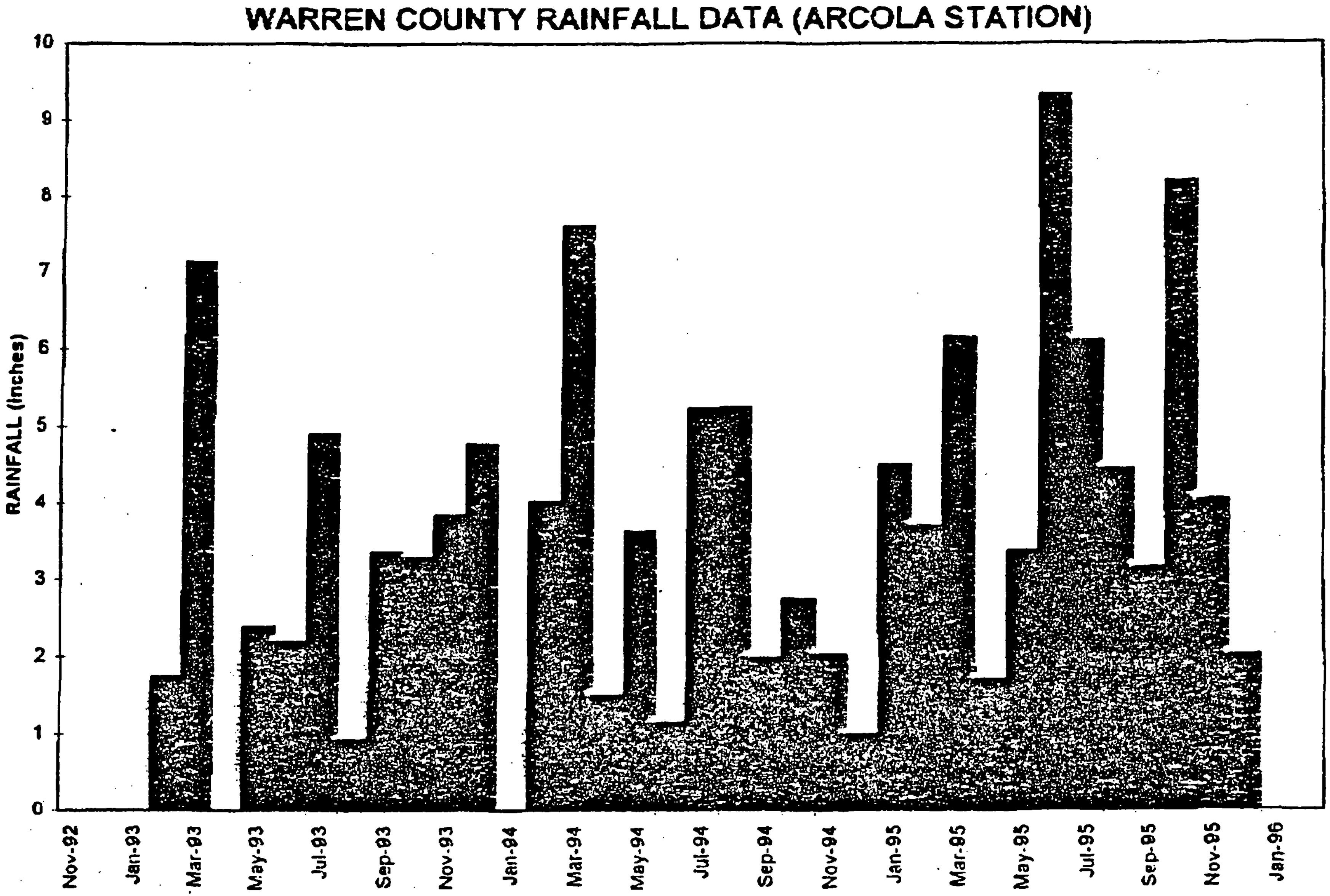
Additionally, based on discussion with State staff, it appears that the stream sediment samples are being collected at the same locations as the water samples (approximately mid-stream). Given that this is not the most likely location for sedimentation to occur, it is doubtful that they are indicative of the potential impact from the landfill.

Discussion

The graph shows the fluctuation of water level as measured in the leachate access pipe and the central vent observation well. The rise and fall of this water level was thought by the State to be directly related to the heating and cooling of the landfill materials. We agree that heating and cooling may result in some fluctuation; however, the heating and cooling process in a system with very little organics (less than 2%) should not result in a long-term increase in water levels as shown by the green line. Moreover, the frequency of the peaks and valleys align very well with that of the monitoring well hydrographs. In our opinion, this is a strong indication that the landfill is functioning as a natural system that is receiving and releasing water. This pattern is not in phase (the peaks of the water in the wells don't match with the peaks of the water in the landfill) with the surrounding area because it takes the water several months to flow through the composite liners. The delayed yield shown is roughly analogous to that which you would expect in a semi-confined, two aquifer system. It is the result of the time it takes water to seep through the upper composite liner. For the period of record, it appears to be fairly constant; however, it is important to note that the rate of leakage will increase over time. The leakage rate is directly related to the permeability of that material, flaws in the liner system resulting from pinholes and holes formed during seam welding, manufacturing defects and vandalism Another potential source of failure is stress cracking or brittle fracture.

The average increase of the water level by approximately 1 foot over the four year period of record is in line with seepage rates used by the USEPA for flexible membrane liners and represents approximately 1/2 inch of leakage per year. It is our opinion that this increase is a good indication that water is seeping into the landfill. The fact that the increase is not a steady incline but varies seasonally is an indication that the system is also discharging water through the bottom liner. There is a net increase in the landfill water level because more enters than leaves the system.

In summary, if no new leakage water was entering the system the water level would remain flat, and if no water was leaving the system the water levels would not decrease then increase in a cyclical pattern.



Note: Months with no data represent missing or incomplete rain gauge data